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Hydro-electric Power.

ELSEWHERE in this issue will be found an announcement of the holding of a sectional meeting of the World Power Conference on the complete utilisation of water-power resources at Barcelona, Spain, in May next. Organised by the Spanish National Committee with the approval of the International Executive Council of the W.P.C., with the official co-operation of the Spanish Government, the meeting will be followed by visits to places of interest in Spain. Apart from coinciding with the Barcelona Fair, which will be of considerable magnitude and include an engineering section that promises to be of some interest, the W.P.C. Sectional Meeting draws attention to the conditions under which water power has been harnessed in Western Europe during recent years.

The development of hydro-electric power in France is in reality a result of the 1914-18 European war, for it is doubtful if, in 1914, more than half a million kW was developed of the seven million kW which is estimated to be available. The power demanded for the manufacture of military and other requirements that were necessary for the defence of the nation, the need to reduce the importation of coal to the minimum, and the temporary loss of the French coalfields in the North, led to the exploitation of hydraulic resources which had previously been neglected, and would probably have remained undeveloped but for the dire exigency. Consequently, the numerous hydro-electric power stations built during the war period led to development which was particularly marked in the Pyrenees, but they were more or less isolated and of a purely local character; when the war ended, they were deprived of their *raison d'être*, and no normal market for their power existed.

The situation was remedied, though somewhat tardily, by an Act passed in July, 1922, which rendered it possible to construct lines for the transmission of power over long distances, and thus relieve districts overcharged by supplying other parts of the country where supplies of electricity were not available or were not sufficient. Thus, at the end of 1926, there was in operation 170,000 km. of transmission and distribution lines, of which 73,000 km. operated at from 250 to 600 volts, 90,000 km. at from 30,000 to 60,000 volts, and the rest at higher pressures; moreover, the lines are increasing by about 1,000 km. yearly.

However, although local over-production was thereby

overcome to some extent, another danger of much greater gravity in both cause and effect asserted itself. France was faced with a financial crisis the effect of which on the hydro-electric industry was not only to arrest progress for a long period, but also to create a decided preference for steam-driven plant. Hydro-electric concessions which had been granted, and undertakings which had been started, fell into a state of paralysis, for hydraulic stations are more costly to construct than isolated steam equipment, and are less easy to adapt to increases in cost of labour and production. The effect was stagnation in the development of water power, both for industries as well as for transport, and many schemes and proposals for work of this character have consequently been held in abeyance.

The strengthening of French finance and the stabilisation of the franc, although the latter may be regarded as only the lesser of two evils, appear to be producing an effect. Relieved of the haunting fear that a quotation to-day will not be practicable to-morrow, industry and commerce seem to be showing signs of activity. According to the French Minister of Public Works, during 1928 alone hydro-electric plant producing 20,000 kW was put into operation in France, while during 1927 electricity was installed in more than 3,000 communes, partly in the hope of stemming the flow of labour to the towns and as an attempt to replace that which had already left the countryside, with the result that the total consumption of electricity in France amounted to 300 kWh per head of the population.

The French Government appears to realise the importance of developing national hydro-electric power, and thus reducing purchases of coal. Encouragement is being given by favourable concessions and by easier fiscal conditions, and it is safe to say that at present there are very few works and factories in the south-west of France which are entirely steam driven. Progress is also taking place in the Alps and River Rhone districts, and with a return of confidence in national finance, it is more than probable that the period of stagnation is nearing its end.

Rural Electrification.

Evidence of the interest that is being excited by the subject of rural electrification, or, as it may otherwise be termed, the facilitation of the provision in country districts of adequate supplies of electrical energy at such prices as will make its use economical for most power, heating, and lighting purposes outside urban areas, is the increasing frequency with which it forms the subject of discussion at conferences and meetings.

At the National Conference on Agriculture, which took place in London last month, it was resolved that immediate and widespread development of electricity supply in rural areas was essential to the economic reconstruction of rural England, and that co-operation was desirable between local branches of the National Farmers' Union and other agricultural organisations and the electricity supply undertakings, whose representatives should meet in conference to discuss the possibilities in each area; copies of the resolutions were sent to the electrical and agricultural authorities concerned. By far the most important announcement that has been made lately, however, was that of the Minister of Transport when he attended, with the chairman of the Electricity Commission, a recent meeting of the Parliamentary Conservative Party's Agricultural Committee. Amongst the suggestions which the Committee commended to them was the appointment of a representative of rural interests to the Electricity Commission and that a special section of the Commission should be devoted to the consideration of rural matters, and in reply thereto the Minister stated that the appointment of an official who would devote his time solely to the development of electricity supply in rural areas was receiving special consideration.

It would be uncharitable to assume that any significance is attached to the use of the word "official," though much will depend on the post being suitably filled, and the appointment, following the example of Sweden, must be welcomed as an indication of willingness to speed up progress.

The Ideal Home Exhibition.

Just twenty-one years ago the first of the series of Ideal Home Exhibitions was inaugurated at Olympia. Thus this season's show, which is now open to the public, celebrates the majority of what has hitherto been regarded as one of London's most largely attended exhibitions.

The visitor cannot fail to notice the large electrically-operated water fountain illuminated with constantly changing coloured electric light, and the large stands of a number of well-known manufacturers of electric cooking, heating, washing, cleaning, and refrigerating appliances for the home, not to mention the host of smaller domestic devices, form quite an impressive display in the main hall; in addition, a number of electrical companies are exhibiting in the Canadian section in the gallery. A feature of this year's show is the substantial improvement that has been achieved in the illumination of exhibitors' stands generally, whilst most of the sample household lighting fittings to be seen thereon are typical of the most modern ideas in that sphere; some of the glassware now being employed is capable of producing striking effects when utilised in the correct environment, and it is to be hoped that the public will profit by the lesson to be learned, particularly with respect to the value of coloured light appropriately used in the home.

It is to be regretted that the exhibition itself seems, as a whole, to be gradually losing its former essentially practical aspect, and to be tending towards what may be termed the luxurious.

The Gasfilled Lamp Patent.

Many rumours will be set at rest, and at the same time a great deal of speculation will be aroused, by the announcement which appeared in our advertisement pages last week of the intention of the British Thomson-Houston Co., Ltd., to apply for a five years' extension of its gasfilled lamp patent (No. 10,918 of 1913). Few inventions have led to so much litigation, and the proceedings will be watched with the greatest interest by lamp manufacturers, lamp importers, and the legal profession.

Change-Circuit Supply.

Those whose interest has been aroused by the merits of the Wilkinson change-circuit system of supplying electrical energy should profit by a further perusal of the subject as outlined on another page this week. The effect which the system promises to exercise upon a constant-pressure network in the form of economic influence on the load factor was not contemplated, or expected, and has revealed itself quite recently.

The author claims that it is, in itself, a full justification of his method, apart from the good effect of change-circuit arrangements in affording cheap and efficient supplies of energy for both water and apartment heating. At the risk of encouraging egotism on the author's part, little persuasion is needed to appreciate his suggestion as marking an advance in the electricity supply industry that would appear to be of no mean advantage to everyone concerned. It should be clearly apparent that the material economy indicated is not merely a reduction of the "unit" charge of a two-part tariff, which would obviously be a negligible gain; but that it represents a percentage on the whole charge without the aid of any further capital outlay, or other alteration of the operating conditions than the addition of a change-circuit load, which, besides its own separate revenue, economically affects the existing load conditions.

A Hydro-electric Project.

A second development on the Stave River at Ruskin, near Vancouver, is designed to have a final capacity of 172,000 h.p.

By F. E. FULLERTON.

REPRESENTING an outlay of $7,250,000, the construction of another hydro-electric station on the Stave River at Ruskin, near Vancouver, is to be proceeded with at once. This additional development is planned in the belief that all previous estimates of Vancouver's growth will be exceeded. Completion of the first unit, which will develop 43,000 h.p. by means of one generator, is expected by the end of 1930, in time for the peak load of 1930-31. Foundations will be laid, however, for another generator of the same size, which can be put in at any time, and eventually the Ruskin plant may develop 172,000 h.p.

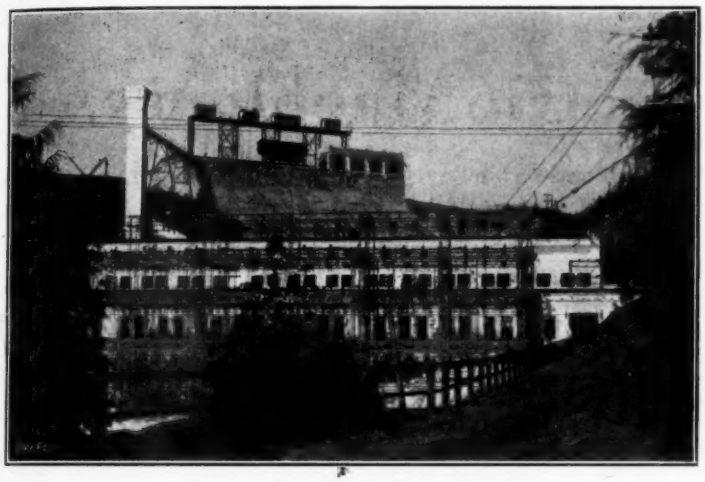


Fig. 1.—Stave Falls Power Station.

It is intended to call for tenders immediately for the first work in connection with the Ruskin development, and it is believed that the scheme starts with the industrial expansion of the British Columbia Power Corp., and that the abundant power available and the low rates which will be offered will attract industries in increasing numbers.

It is interesting to note that the Bridge River development of the B.C. Co. will also be increased, and this change in the plans may slightly delay the completion of the first stage. It had been intended ultimately to enlarge the tunnel at present being driven to twice the present size, and to increase the 165,000-V transmission line later to 220,000 V; it is now decided to enlarge the tunnel and make provision for transmission at 220,000 V immediately. It had also been intended to build a steam generating station as a stand-by in view of the length of the transmission line from Bridge River, but the decision has now been made that it will be better to develop the Ruskin site immediately, from which power will be transmitted over a comparatively short distance. The Ruskin plant will serve in a dual capacity because its comparatively short transmission line will not be so liable to breakdown. In any event, the mainland power system will, on the completion of the Bridge River and Ruskin plants, draw power from six independent sources, and there is small likelihood that all six will be out of commission at one time. The Ruskin station will eventually use all the water now passing through the Stave Falls plant, some of which also passes through the Alouette plant.

The first work will be to build a dam across the Stave River, at a point about three and a half miles below the Stave Falls plant. Tenders for this were to be called so that work could be started as soon as possible after February 1st. Two short tunnels will be driven through the rock, providing for the penstocks that will convey water to the generators.

The dam will be of concrete with a maximum height of 183 feet and a length of 325 feet at the crest. It will be necessary to make coffer dams of cribwork and sheet piling both above and below the site of the dam, after which excavation to the bedrock will take place. Provision for diverting the flow of the river will be made by means of a flume at the side of the canyon, which flume will pass through an opening in the dam and will not be closed until the dam is completed. In all, the dam will contain 90,000 cubic yards of concrete and will not be finished until August, 1930. It will be surmounted by seven regulating gates to control the flood over-flow.

An immediate start will also be made on excavating the power-house site. The foundations of the building will go 50 feet below the level of the tail race. To permit this work to proceed, a coffer dam will be necessary to keep the water from backing up into the work ings. No steel penstocks will be visible in this plant, but a tunnel for each turbine and generator will convey water directly from the reservoir above the dam. The new plant will operate under a head of 125 feet, as compared with an average head of 115 feet at the Stave Falls plant. This head represents the entire fall of water from Stave Lake to the Fraser River, and when the new dam is built water will be actually backed up to the tail race of the Stave Falls plant.

Fig. 2.—Blind Slough Dam.

The formation of this new lake will entail the re-

building of the railway line from Ruskin to Stave Falls, the present tracks being within the area which will be flooded. At the site of the new development there will be a new railway bridge across the river to convey the heavy machinery to the generating station. Considerable roadwork will also be necessary in the vicinity to provide access to the site from the Dewdney trunk road and the valley above. A complete outdoor switching and transforming station will be built in connection with this new station, and electricity will be conveyed to the Horne-Payne receiving station, Vancouver, at 60,000 V.

It is estimated that the Ruskin plant, when fully developed, will be capable of supplying 328,000,000 kWh per year, as compared with 280,000,000 kWh by the Stave Falls station. The new installation, however, will be used as a peak-load plant, and therefore more generator capacity will be installed than would be the case were it to be used more or less continuously.

As the Ruskin plant will be able to draw water only as it passes through the Stave Falls, and to a certain extent through the Alouette plant, its operation will be governed to some extent by the operations of these former installations.

Fig. 1 is a view of the Stave Falls power station, and fig. 2 shows the Blind Slough dam at Stave Falls.

Agricultural Electric Machinery.—I.

A review of the 1929 Paris Agricultural Exhibition, depicting some selected items of special interest to electrical engineers.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S.

THIS annual exhibition, which is now in its eighth session, continues to grow in popularity and to attract an ever-increasing number of exhibitors, the total this year being 705; the standard of the exhibits is also being raised. For one thing, 28 applications for stands by "cheap-jacks," or men who sell small domestic appliances by sheer force of their personality, were refused. Next year it is proposed not to permit the exhibition of any washing machines or other similar domestic appliances, as, however useful they may be in the farmhouse, space is becoming so valuable that it is necessary to reserve it exclusively for machinery actually employed on the farm. The present exhibition space is about 21,000 sq. yd., divided over three halls, plus a considerable outdoor area. A new building is to be constructed during the next few years, with an area of 50,000 sq. yd., which will enable the whole show to be housed under one roof.

About 150,000 people pay for admission during the few days the exhibition is open, but a far larger number of visitors receive free invitations. About two million circulars are distributed throughout the country in advance.

While the French Government does not control the show in any way, the Ministry of Agriculture assists considerably by advertising it, and also it is well supported by the French Ministers. The general manager, Mr. A. Villard, is to be congratulated upon the excellent organisation that he has established. In one feature he probably does not gain the entire satisfaction of the exhibitors, for the show is very strictly classified, *i.e.*, all articles of one class must be shown in one section. This is of very great convenience to a visitor, as it so greatly facilitates comparison and inspection and, further, ensures that he does not overlook an exhibit of one of a particular class of machines; but, of course, it must be inconvenient for the exhibitor of several types of apparatus to have to establish several stands.

The catalogue this year was prepared in four languages, a much appreciated concession to the greatly increasing number of foreign visitors.

The exhibits may well be considered under the main groups in which they were arranged, namely, (1) thrashing and harvesting machinery and mechanical cultivators; (2) ploughs and implements; (3) barn machinery and equipment for the smaller agricultural industries, such as poultry keeping, and so on.

Thrashing Machines.—It is worthy of note that the finest examples were of British make (Ransomes, Sims and Jefferies, Ltd.) or of British design (Hoffer-Schrantz-Clayton-Shuttleworth, of Budapest). A considerable number of the thrashing machines were shown in operation, driven, of course, by electric motors. A criticism was made of the drives last year, that in many of them the electric motors were placed too high up on the machines, a practice not conducive to a reduction of the machine vibration. This year several makers placed the motor underneath. There were no directly-coupled drives, but it was noteworthy that practical experience is teaching the manufacturers that the belt drive must be as long as possible. While the aforementioned British machines are undoubtedly the best types for practical work, they are not satisfactory as complete units; hence the writer selected the Brouhot thrasher as being the best self-contained combination suitable for the average farmer. This machine has many excellent improvements, including a very neat electric drive, the motor

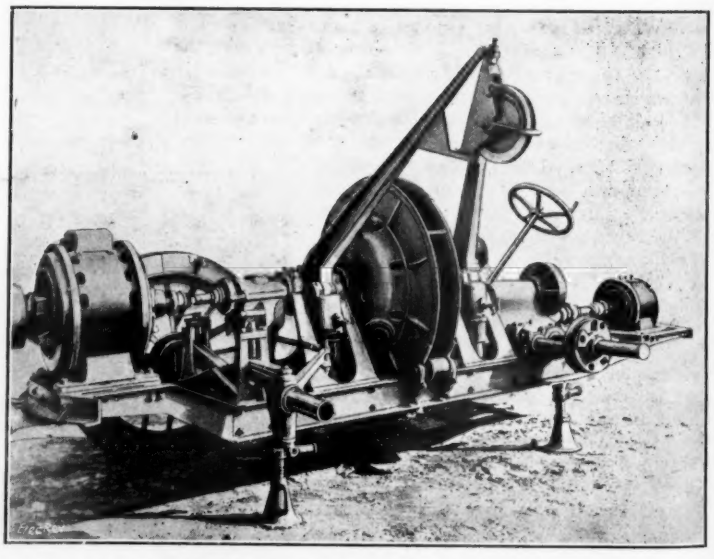


Fig. 1.—Estrade Plough with Casings and Wheels Removed.

being placed underneath the frame. The motor is of the Dassenoy type, 3,000 r.p.m., which means a comparatively light motor. There were more motors of this make applied to thrashing machines than of any other make. The motor has a sliding armature which is held out of the field when at rest by means of a spring. It is started by an ordinary switch, and as the

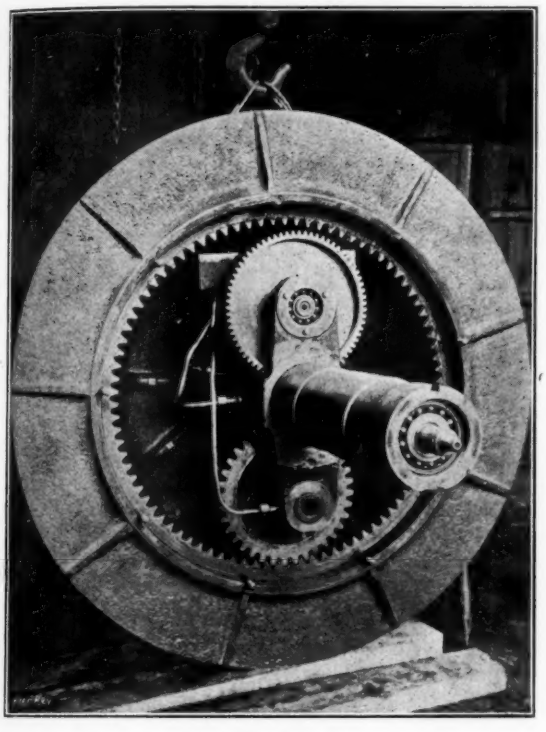


Fig. 2.—Estrade Plough Reduction Gear.

load comes on, the armature, as it attains its proper speed, is drawn into the field against the pressure of the spring.

There were no electrical applications to harvesting machines, though, as an item of mechanical interest, the complete, giant, combined machines for cutting the corn, thrashing, sorting and sacking it, and disposing of the sheaves of straw in bundles, all in one continuous operation on the field, are wonderful examples of modern ingenuity in high-speed work and labour-saving. One of these very interesting machines was tested out in Oxfordshire last year. There is no question as to their utility in hot, dry climates, but their application is a little more doubtful in damper countries, though even there it depends upon the nature of the corn that is grown.

Ploughs.—The typical French plough is an enormous vehicle capable of dealing with from fifteen to thirty acres per day, with a power ranging up to 150 h.p., so that manufacturers had only photographs and models on view. A recent development in electric ploughing is that the large French electricity supply companies are purchasing and operating ploughs themselves for the benefit of their farmer clients. This enterprise is partly due to the large amount of capital required and partly to the importance to the supply authorities of making sure that the plough is operated every possible working day. The manufacturers of farm oil tractors have now taken a leaf from the book of the electrical man, and have standardised powerful electric headlights fixed to their machines, supplied from a small motor-car type of generating set, so that the contractor can continue his operations far into the night. Electricity supply undertakings which are interesting themselves in electric ploughing are the Société Nord Lumière, Société Nord-Est Parisien, Société Ouest Lumière, Société Sud Lumière and Société Lorraine d'Electricité. The following Co-operative Societies are also operating electric ploughs:—La Co-opérative de Saclay, La Co-opérative du Vexin, La Co-opérative du Multien and La Société Générale Agricole. Many of the parts used in the construction of the larger ploughs come from England, where they are made by steam-plough manufacturers; the main framework and electrical gear is, naturally, of French manufacture. The switchgear does not seem to be quite substantial enough for the rough handling that it is likely to get in use. Last year, owing to the demand that is rapidly arising for smaller electric ploughs capable of handling from five to ten acres per day, several new designs were evolved.

A machine constructed by the Société Générale Agricole is of the double-winder type. Apparently a very successful 30-h.p. electric plough is that of the Société d'Electro Motocultur, of Carcassone. The pull of the rope hauling the plough is taken by a lever which extends from the side of the machine, and the inner end of this lever is supported on oil-filled cylinders which permit alteration of the angle of the lever, according to the strain put upon it. A practical result of this design is that full advantage is taken of transmitting as much of the pull as possible on to the ground, hence the haulage power of the machine is very considerably greater than would be anticipated from its dead-weight.

Fig. 1 shows an Estrade electric plough with the casings and the wheels removed; the transporting motor is at the right, and the 30-h.p. haulage motor is on the left. The reduction gearing of an Estrade plough is depicted in fig. 2.

Fig. 3 is an interesting illustration in that it shows the enormous boulders pulled out of the ground

Fig. 3.—Electric Plough Working under Severe Conditions.

by the plough. It is when a plough comes into contact with such obstacles that the advantage of having a power station behind the haulage gear becomes apparent. These boulders were pulled out of the ground during some electric ploughing trials at the School of Agriculture at Gryon, and, incidentally, it may be remarked that this was the only equipment which success-

fully came through the very severe trials over such exceptionally difficult ground.

An entirely new 5-h.p. electric plough and garden cultivator was exhibited by the Société Générale Agricole. This is designed to meet the requirements of the market gardener, and is of the double-drum, single-haulage type, the rope passing around a pulley on a carriage at the far side of the ground to be worked. A water tank forms a part of the anchor pulley carriage as an easy means of adding sufficient weight. This equipment is intended for work over areas up to 160 ft. wide, and it will plough from 6 to 14 in. deep, with a maximum demand of 3 h.p. The haulage gear and the anchor wagon are both mounted on portable tram-rails. such as are very often used in French market gardens. The equipment is capable of ploughing from 1,500 to 3,000 sq. yd. per day, and the machine is, of course, intended to operate all forms of market garden implements in addition to ploughs. A direct drive is arranged on the motor, so that it may be employed for other purposes than cultivating, *e.g.*, the watering of gardens, the distribution of artificial manure, as a fire pump and as a sack elevator. A shaft with "Hooke" joints is also provided for operating barn machinery, such as circular saws.

For ploughing and other land work on a large scale, the 100-h.p. double-haulage S.G.A. sets should be selected. For medium work, the 30-h.p. Estrade equipment seemed to be the most attractive apparatus. For market gardens, the S.G.A. 5-h.p. apparatus should be considered, though undoubtedly it is at present in its early stages of development.

Electricity Supply in Australia.

The History and Progress of the Melbourne Electric Supply Co., Ltd.

By F. W. CLEMENTS, M.Inst.C.E., M.I.E.E. (Managing Director and Chief Engineer).

THE undertakings of the Melbourne Electric Supply Co., Ltd., in the State of Victoria, Australia, after thirty years of active development, will shortly pass into the control and ownership of the State Electricity Commission of Victoria. In view of the fact that it is by far the largest electricity supply undertaking in Australasia in private ownership and, in fact, second amongst all such undertakings as regards population and number of consumers served, it is thought that the following notes on the history of the company, which has undoubtedly made its mark on electricity supply in Australia, might be of interest.

The company was registered on August 17th, 1899, commencing business as the Electric Lighting and Traction Co. of Australia, Ltd., with an authorised capital of £300,000, and having its registered office in London. Its first Board included well-known members associated with the pioneering days of electricity supply, namely, Mr. J. B. Braithwaite, as chairman, and the late Mr. R. P. Sellon, as managing director. Mr. W. E. Lane was appointed secretary, and Mr. F. W. Clements (the company's present managing director and chief engineer), representative at the actual scene of operations in Australia. The company was formed for the purpose of acquiring the small undertakings of the New Australian Electric Co., Ltd., and the A.U. Alcock Electric Light and Motive Power Co., Ltd., each of which had been granted Parliamentary powers under the Victorian Electric Light and Power Act, 1896, for supplying electricity within the city and certain suburbs of Melbourne. The advent of the new company marked the first important attempt to build up a generating and distributing system over a wide area. The purchase of the two undertakings mentioned above was completed in January, 1901, and an extended Order-in-Council, covering the supply of electricity to some of the then most important suburbs of Melbourne, but not including the central area supplied by the Melbourne City Council, was granted to the new company for a period of twenty-five years, dating from November 13th, 1900. From that date onwards the company has steadily extended its mains throughout other municipal areas as the rapid growth of population required, and has made available a supply in bulk to a very considerable area in the extreme outer suburbs of the metropolis, where the local authorities decided to carry out their own distribution. The generation of electricity for the Melbourne area was concentrated at a central power station situated at Richmond, on the banks of the river Yarra, on the site of the partially-constructed station of the New Australian Co.'s undertaking, and orders for additional plant were immediately placed and the conversion and consolidation of the two different single-phase a.c. systems in use commenced.

A separate Order-in-Council was also acquired by the company, conferring the rights of supply to the City of Geelong and its environs (forty-eight miles from Melbourne), this order covering a period of thirty years, dating from February 20th, 1899, and a permanent supply of electricity from the company's newly constructed d.c. power house in that city was commenced in May, 1901, no supply having been available before that date. The company secured further Parliamentary powers for supplying in the neighbouring State of South Australia, the franchise being acquired with the purchase of the embryo undertaking of the South Australian Electric Light and Motive Power Co., Ltd. This purchase included a small station operating at Port Adelaide, nine miles from Adelaide City, but the company ultimately decided to cease generating there in favour of distribution by high-pressure mains from a new station which was opened in the capital City of Adelaide in November, 1901.

Progress during the early years was necessarily slow, owing to the enormous areas covered by Australian cities, which in the case of Melbourne were purely suburban areas, over which distribution had to be provided; nevertheless, the company pressed forward with development programmes involving capital expenditure far in advance of revenue returns, and results have more than justified this far-sighted policy. Had it not been for the courageous support of British capital and the shrewd foresight of the company's management during those early days, the progress of electrical development, in Victoria especially, must have been seriously retarded. In order to concentrate on the growing demands of the Melbourne and Geelong districts, the Adelaide interests were transferred in April, 1905, to the Adelaide Electric Supply Co., Ltd., in which the parent company retained a large holding in shares. This undertaking has likewise developed under its capable management to a remarkable degree, operating as it does not only within the large City of Adelaide, but, by means of an extended system of transmission lines, throughout a considerable portion of the State of South Australia.

The demands on the Melbourne and Geelong stations increased so steadily that it was necessary to adjust the company's finances in 1908, when the authorised capital

was increased to £450,000, the title was changed to that of the Melbourne Electric Supply Co., Ltd., and a local board of directors was set up in Melbourne. The output of the two stations at that time is shown in the following table:—

1908.	Melbourne.	Geelong.
Number of consumers	1,727	586
Motors in rated horse-power ...	2,150	818
Total kWh sold	2,326,307	312,661

In 1910 the company's area was extended by the addition of three further Melbourne suburbs, and a contract was made for a supply of electric power from the Melbourne power house to the Prahran-Malvern Municipal Tramways. In the same year a system of electric tramways was commenced by the company at Geelong, the first portion of which was opened for traffic in March, 1912. A further extension of the company's Melbourne area was made in 1912 by an Order-in-Council covering supplies to three additional suburbs.

In 1914, after fifteen years' operations, the capital expenditure on the Melbourne and Geelong undertakings had passed the £1,000,000 mark, and in 1915, despite the adverse influences of war and drought, the continued expansion necessitated an increase of the authorised capital to £750,000. Progress at that time was so rapid that within the next two years the capital had to be doubled, an increase to £1,500,000 being made in 1917. That sum was further increased to £1,750,000 in 1921, in which year the board and general management were transferred from London to the actual seat of the company's operations in Melbourne. The members of the new board were the Hon. Agar Wynne, chairman, the Hon. W. L. Baillieu, and Messrs. J. S. Teulon and F. W. Clements, all of whom still continue in office. Mr. W. E. Lane was appointed London manager and secretary, and Mr. W. J. Mountain, who had been associated in a similar capacity with one of the undertakings originally acquired, was appointed secretary to the company.

The phenomenal development of the past ten years furnishes a complete justification for the faith of the company's founders in the development of a mainly suburban undertaking, the foresight of its management and the fortitude of those who supplied the necessary funds during the difficult early years. The following table shows the growth of capital expenditure in the development of the company's business during the last ten years:—

CAPITAL EXPENDITURE.

	£
Total to August, 1919	1,770,581
" " 1920	1,982,043
" " 1921	2,372,386
" " 1922	2,817,058
" " 1923	3,154,859
" " 1924	3,471,860
" " 1925	3,795,883
" " 1926	4,110,919
" " 1927	4,518,427
" " 1928	4,940,806

The company has very completely developed its extensive districts in Melbourne and Geelong. Out of a total area of over 207 square miles, its distribution networks, both overhead and underground, cover 116 square miles, with a population of 580,000 inhabitants. Supply has been made available in 1,222 miles of streets, the number of consumers aggregating 130,503. That very full use of the supply is made by consumers of the residential class is evident from the fact that they number over 80 per cent. of the possible maximum number of consumers within the area, on the basis of four persons to a family. Saturation as regards the number of consumers is, therefore, within measurable distance; this is also the case in some of the more populated portions of the U.S.A. Hence increase in domestic consumption in the future will arise mainly out of the erection of new residences and also out of the more intensive electrification of the home; to the latter the company is devoting special attention, while the introduction two years ago of a two-part domestic tariff based on the number of rooms is having the expected effect in assisting towards this end. By especially fostering cheap power for industrial purposes, the company has played no small part in the development of the Geelong district, where unusual progress has been made during the past few years in the establishment of important new industrial undertakings, the connected industrial load per head of population being over twice that obtaining in the Melbourne area. Geelong, with its new system of three-phase supply and its modern highly efficient power house, seems destined to become an industrial centre of considerable importance within the State.

The following tables show the remarkable growth in demand during the ten years from 1919 to 1928:—

MELBOURNE.

Year ended	Number of Consumers.	Lighting, &c., in Kilowatts.	Motors in Rated h.p.	Total kWh Sold.
August 31st, 1919 ...	42,430	36,189	30,318	35,069,000
" " 1920 ...	51,675	44,006	34,478	44,444,000
" " 1921 ...	60,393	54,370	38,300	51,380,000
" " 1922 ...	69,261	64,300	45,100	63,070,000
" " 1923 ...	80,597	77,650	53,950	73,500,000
" " 1924 ...	92,649	93,800	66,900	87,500,000
" " 1925 ...	101,360	109,780	76,800	96,900,000
" " 1926 ...	108,689	114,090	84,140	107,140,000
" " 1927 ...	116,080	126,780	90,020	114,447,000
" " 1928 ...	120,864	141,050	92,720	104,213,000

GEELONG.

Year ended	Number of Consumers.	Lighting, &c., in Kilowatts.	Motors in Rated h.p.	Total kWh Sold.
August 31st, 1919 ...	3,374	3,082	2,415	1,551,042
" " 1920 ...	3,862	3,384	2,509	1,627,276
" " 1921 ...	4,409	3,743	2,677	1,848,800
" " 1922 ...	4,875	4,044	4,395	2,544,000
" " 1923 ...	5,601	4,923	6,547	8,675,400
" " 1924 ...	6,431	6,530	7,600	11,394,000
" " 1925 ...	7,045	7,570	9,300	14,300,000
" " 1926 ...	7,845	8,520	13,000	18,230,000
" " 1927 ...	8,884	9,480	14,120	27,059,000
" " 1928 ...	9,639	10,160	14,780	26,010,000

The company's original franchise for the Melbourne suburban area expired in November, 1925, and it is now operating under a special Act of Parliament (the Melbourne Electric Supply Company Act, 1924) which provides for extension to August 31st, 1935, on which date the State Electricity Commission will purchase all the company's undertakings, unless the Commission has previously exercised options to purchase at the intervening dates of August 31st, 1930, or February 28th, 1933.

With the expansion of the State Electricity Commission's activities the company has, during the past few years, made increasing use of the Commission's power supply, the company's Melbourne power house having actually ceased generating in 1926 and its consumers being now dependent for energy on bulk supplies from the Commission. Arrangements are in hand, however, to reactivate this power house for the purpose of supplementing the supply in the metropolitan area, and in this connection a new three-phase 15,000-kW turbo-alternator is being installed. The company's single-phase distributing system is in course of conversion to three-phase, and this work is now nearing completion. Its Geelong undertaking had already converted from continuous current to three-phase some nine years previously.

With the recent intensive development of country districts and the utilisation of the State's natural resources of lignite and hydraulic power by the State Electricity Commission, and with its large scheme of railway electrification, Victoria bids fair to become the most highly electrified State of the Australian Commonwealth; and the company can look back with satisfaction to the past thirty years in the knowledge that it is largely due to its own enterprise and pioneer work under initially difficult conditions that present-day developments have become possible.

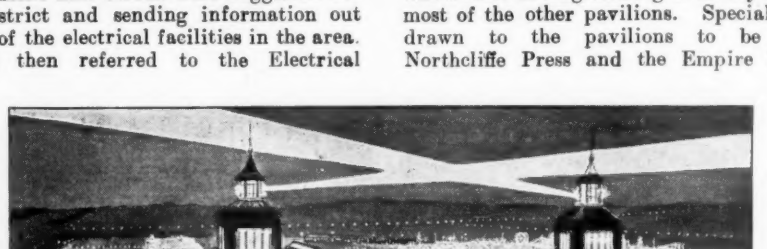
The North-East-Coast Exhibition.

A Big Effort to Revive Trade in an Important Industrial Area.

By R. E. ROBSON, M.I.E.E.

THE Exhibition which is to be held from May to October this year in Northumbria, now commonly known as the North-East Coast, is a huge undertaking at a time of great trade depression. The Exhibition is being organised mainly to revive industry and trade in that important area.

The North-East-Coast Area Committee of E.D.A. may take a considerable amount of credit for having sown a seed which eventually developed into an undertaking very much greater than ever anticipated. At one of the E.D.A. Committee meetings in Newcastle some two years ago the question of bringing new industries to the Tyne was discussed and means were suggested for advertising the district and sending information out giving particulars of the electrical facilities in the area. This matter was then referred to the Electrical Section of the Newcastle and Gateshead Chamber of Commerce with Mr. H. W. Clothier as chairman, who soon took the matter up with great vigour and brought it before the notice of the Executive Committee of the Chamber, which from this scheme of advertising the area suggested that an exhibition should be held. The Lord Mayor of Newcastle and the mayors of all the principal towns in the Counties of Northumberland and Durham, and the Cleveland district of Yorkshire met and it was decided to promote an exhibition. A guarantee fund was put into operation and nearly £200,000 was guaranteed in a very short time.



The North-East-Coast Exhibition, 1929.

The Lord Mayor of Newcastle, Councillor Arthur Lambert, M.C., J.P., has taken great interest in the scheme, and owing to his untiring energy the undertaking has developed to gigantic proportions.

The Exhibition has had the hearty support of such large electrical undertakings as the Newcastle-upon-Tyne Electric Supply Co., Ltd., the Newcastle and District Electric Lighting Co., Ltd., Messrs. C. A. Parsons & Co., Ltd., Messrs. A. Reyrolle & Co., Ltd., Messrs. Clarke, Chapman & Co., Ltd., and many others which will have large exhibits in the show.

The Electrical Development Association is arranging a bureau and kinematograph room on its stall with many panels describing the applications of electricity. E.L.M.A. is to have a stand brilliantly illuminated by the most modern methods of panel and ceiling lighting with many thousands of lamps. The Newcastle Electric Supply Co., Ltd., is to have large stands both in the Palace of Engineering and the Palace of Industry, and is having them fitted up elaborately with the most modern methods of lighting and industrial heating.

The Exhibition covers the same ground as the great exhibition held in 1887, but is considerably larger. It is within one mile of the Central railway station, and on the Great North Road 276 miles from Charing Cross.

Many conferences will be held during the period of the Exhibition promoted by various associations in the engineering world as well as in many other industries. The displays of E.L.M.A. and E.D.A. are the only exhibits which might be termed joint exhibits in the Electrical Section; the other electrical associations have allowed their individual members a free hand and they are exhibiting individually. Messrs. J. H. Holmes and Co., Ltd., who were exhibitors in the Exhibition of 1887, are to exhibit their "Castle" dynamos and motors.

The building of the Palace of Industry is absolutely complete and has been handed over by the contractors. The Palace of Engineering is nearly finished and so are most of the other pavilions. Special attention may be drawn to the pavilions to be erected by the Northcliffe Press and the Empire Marketing Board, which are huge affairs.

The asphalt paths and walks are practically complete, and even in the early days visitors will not find it so difficult to walk about in the grounds as they did at Wembley. There are two large towers in the Exhibition and each will be fitted with a powerful search-light supplied by Messrs. C. A. Parsons & Co., Ltd., in conjunction with the London Electric Firm.

Messrs. Mountain, Wood & Maclean are the electrical consulting engineers for the Exhibition, and there is no question but that the undertaking will be a gigantic success. There can be only one thing to act detrimentally, and that is the weather.

The Exhibition will be opened on May 14th next by H.R.H. the Prince of Wales, H.M. the King is patron and the Duke of Northumberland, the Marquis of Londonderry, and Sir Hugh Bell, C.B., J.P., are local patrons. The president is Sir Charles A. Parsons, O.M.; the chairman is the Lord Mayor of Newcastle; and the general manager is Mr. C. P. Hainsworth, who has organised many exhibitions all over the world.

A full scheme of illumination for the buildings and grounds has been prepared by Messrs. Mountain, Wood and Maclean. The outside lighting includes the use of decorative pillars for the Main Avenue and Grand Court. In addition, there will be a scheme of flood-lighting for the whole of the walls of the Palace of Engineering, the Palace of Industries and the towers. There will also be an illuminated fountain in the middle of the Main Avenue, equipped with a very ingenious colour-changing scheme. For the general illumination of the buildings and for outside lighting, something like 10,000 lamps will be required. This does not take into account the very large number which will be used in the Amusement Park. The lamps in the grounds and pillars will be of many colours.

A view of the Exhibition prepared from the architect's drawings is reproduced herewith.

Supplementary Change-circuit Supply.

An examination of the economics of electricity generation in relation to load factor, or the incidence of a supplementary change-circuit system with respect to constant-pressure supply costs.

By GEORGE WILKINSON, M.I.E.E., M.I.Mech.E., M.Cons.E.

A VIGOROUS national policy is now operating in the electricity supply business of this country. The main lines of that policy are directed towards placing a supply of energy within reach of every district, and to reducing the cost of generation and distribution by sweeping measures of co-ordination and large-scale development. Nevertheless, there is no indication that the general level of charges for electricity will be reduced by those measures to such an extent as will make electricity the generally adopted form of energy for all domestic purposes.

An enormous amount of technical skill is being expended upon the science of economic generation, and a large amount is also concentrated upon the problem of distribution: quite erroneously, the all-important

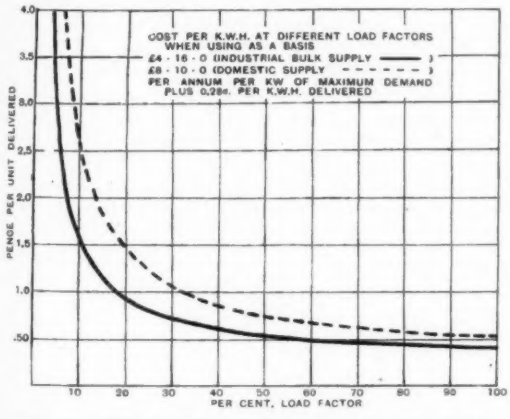


Fig. 1.—Effect of Load Factor on Energy Sold.

problem of a cheap supply has been assumed to be principally dependent upon these two considerations. It is certain that so long as the industry is content to find money to build expensive electricity generating plant, which is lucratively employed only during some six to eight hours out of every twenty-four, so long must electricity remain comparatively expensive.

One has only to glance at the charges at present in vogue to appreciate the true direction of development which must be encouraged. Fig. 1 has been plotted to show the effect of load factor on the cost per kWh delivered, taking as a basis the charge of £4 16s. per kW of maximum demand, plus 0.28d. per kWh delivered, which is a typical charge for a bulk supply to an industrial concern; the full-line curve shows that the total cost per kWh delivered may be 2.0d. at a 7.5 per cent. load factor, or 0.60d. at a 40 per cent. load factor, a ratio of more than three to one.

As is well understood, the maximum-demand charge is imposed to cover the capital cost of the plant installed and maintained to carry the maximum load, whilst the "unit" charge meets the running cost of the conversion of fuel energy into electrical energy. In the case of a domestic supply there is an increased cost of distribution which, on the same basis, would probably increase the standing charge to £8 10s. per annum for each kW of maximum demand, the "unit" charge remaining the same. It is seen from the dotted curve in fig. 1 why a purely lighting load with its extremely low load factor is comparatively costly per kWh, but with thermal storage to raise the load factor the inclusive overall charge may be 0.60d. per kWh.

Several articles in the technical Press, and the description of demonstration plant* at the Stafford works of the English Electric Co., Ltd., have dealt with the application of the change-circuit system to increase the load factor and provide a thermal-storage load during the off-peak periods. The main purpose of this article, however, is to examine the economics of electricity generation in relation to load factor.

We may consider the average guaranteed steam consumption of a modern 6,000-kW plant to be:—

11.13 lb. of steam per kWh at full load.
11.46 lb. of steam per kWh at ¾ load.
12.12 lb. of steam per kWh at ½ load.
14.26 lb. of steam per kWh at ¼ load.

Assuming the unusually high load factor of approximately 40 per cent., such as is found in districts including chemical or cement works, we may consider that the plant operates for two hours at full load, for eight hours at half load, and for fourteen hours at quarter load, from which figures it may easily be calculated, on the basis of a 6,000-kW steam turbo-generator set, that 57,000 kWh would be generated daily at cost of 723,000 lb. of steam, or an average of 12.7 lb. of steam per kWh. Of that load 12,000 kWh will have been generated during the period of full load and 45,000 kWh during lighter-load periods.

If under those circumstances a change-circuit load had been employed which did not allow the load factor to fall below 75 per cent., the twenty-two hours of full load would have worked out at 11.46 lb. of steam per kWh, instead of the actual average of 13.12 lb. The same amount of coal, wages, salaries, interest, and sinking fund contribution would, therefore, have produced:—

$$45{,}000 \times 13.12/11.46 = 51{,}500 \text{ kWh},$$

or an increase of 14.4 per cent.

The two hours at full load would, of course, be unaffected. The total for twenty-four hours would be 63,500 kWh, or an increase of 11.4 per cent. In addition, credit must be added for the improved boiler efficiency secured by the larger and steadier loads, and for the freedom from the necessity of maintaining boilers under steam for emergency load. These boiler economies will add, as a conservative estimate, another 5 per cent. in energy for the same amount of fuel consumed without any increase of any kind in running or capital charges.

A comparison more closely approximating to the

* Elec. Rev., January 27th, 1928.

average conditions met with to-day would be a load factor of 25 per cent. made up of, say:—

1 hour at full load, 6,000 kWh, using	66,708 lb. steam
4 hours at ½ load, 12,000 kWh, using	145,440 lb. steam
8 hours at ¼ load, 12,000 kWh, using	171,120 lb. steam
11 hours at light load, 6,000 kWh, using	96,000 lb. steam
36,000 kWh	479,268 lb. steam

from which figures the average for the twenty-four hours is 13.33 lb. of steam per kWh, and the average for the twenty-three hours at reduced load is 13.75 lb. If this period had been kept up to 75 per cent. load factor by means of change-circuit thermal-storage load at a steam consumption of 11.46 lb., the energy generated by the 412,560 lb. of steam used in twenty-three hours would have been 36,000 kWh, or a 20 per cent. increase. Taking into account the long periods of light running, one can safely say that the higher boiler-plant efficiency

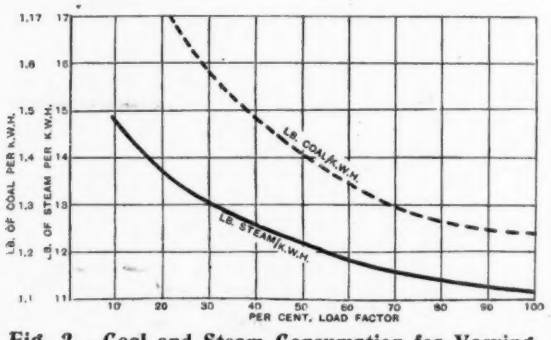


Fig. 2.—Coal and Steam Consumption for Varying Load Factor.

would add another 10 per cent. of energy for the same coal consumption, making an increase of at least 30 per cent. over the twenty-three hours during which the change-circuit system is carrying load.

It should be fully understood that the economies indicated are not a mere reduction on the "unit" charge of a two-part tariff, which would be a negligible gain; but they are a percentage on the whole charge without any further capital outlay, or any alteration in the conditions of working, except the addition of a change-circuit load which, in addition to its own separate revenue, has effected these economies in the existing load conditions.

Fig. 2 shows the steam consumption per kWh at differing load factors, using the turbo-generator figures quoted above; the dotted line shows the coal consumption per kWh, allowing 9 lb. of steam per lb. of coal consumed, with an allowance for reduced boiler-house efficiency when long periods of light-load running are experienced (up to 10 per cent increased coal consumption, or 25 per cent. load factor).

These diagrams show graphically the tremendous importance of load factor to the economic generation and utilisation of electricity. From the diagram a concrete case may be worked out to show the present average and the possible earnings of the same generating plant under different conditions:—

Case 1—25 per cent. factor, 6,000-kW set:—
Energy generated per day = 36,000 kWh; coal consumption at 1.64 lb. = 59,000 lb.; revenue at 0.80d. = £120.

Case 2—Same coal consumption as above at constant pressure, maintained up to 75 per cent. load factor with change-circuit load:—
Energy generated per day, constant pressure = 46,300 kWh.
Energy generated per day, change circuit = 63,300 kWh.
Coal consumption at 1.275 lb. = 139,800 lb.
Revenue at 0.625d., constant pressure = £120.
Revenue at 0.33d., change circuit = £88.

Therefore the total revenue = £208,

or an increase of over 70 per cent, which shows a reduction of 22 per cent. in cost of electricity to the constant-pressure consumers *without any alteration whatever in the cost to the electricity supply authorities* and, *in addition*, a daily revenue of £88 for change-circuit supply charged at 0.33d. per kWh.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Post Office Affairs.

On March 4th, the House of Commons considered the Post Office Estimates.

Mr. Crawford strongly advocated a return to penny postage, which, he said, would benefit trade and industry. He also urged that broadcasting should be made use of during the coming General Election.

Mr. Lloyd George supported the suggestion that broadcasting should be used during the election.

Mr. Snowden said that if the penny post could be restored without loss to the Post Office it should be done, but he would not favour subsidising the Post Office out of the money of the taxpayers.

Other members criticised the working of the telephone service, and, in reply to the debate, Sir W. Mitchell-Thomson, Postmaster-General, compared broadcasting in this country with that in America, and pointed out that the congestion of the air did not affect America to the same extent as it did this country. America was not subjected to interruption in broadcasting as we were by the activities of our neighbours. We were so closely congested that we only had ten exclusive wavelengths for our own use, and it was a matter of anxious consideration between the B.B.C. and himself how to make the best use of those wave-lengths. If broadcasting was entirely in the hands of the Government, it would open the way to charges that the Government was using it for its own party propaganda. It was better in the public interest to have the system controlled by a public corporation rather than by the State. The attempt to come to an agreement as to a fair allocation of the use of broadcasting between the respective political parties had broken down. A return to penny postage would cost between £6,000,000 and £6,250,000 in the first year. Those who advocated such a return must remember that the cost had got to be met somehow, either out of a Budget surplus or other revenue. As to telephone development, the number of telephones had increased by nearly 40 per cent. in the last four years. The capital expenditure on telephones during the past four years amounted to £44,000,000, every penny of which had to be paid out of revenue, both as to interest and depreciation. He did not see how more capital could be usefully spent on telephone development. We were now the third largest telephone-using country in the world. Five-sixths of the total telephone mileage was already underground, which was a larger percentage than in any other country in the world. While the increase in the general telephone service had been at the rate of 38 per cent. during the last four years, the increase in the rural areas during that period had been about twice that figure. Experiments had been in progress to ascertain whether small automatic exchanges could be provided, and that problem was in a fair way to solution. Two of those exchanges had now been started. Twenty more were in course of erection, and many others would be provided in the near future. The automatic system could be installed in a kiosk and gave a night as well as a day service. Another thing on which they had been experimenting, and which looked like coming to fruition, was the construction of a combined hand set telephone. They hoped to produce a set which would be an improvement on the latest American type. Arrangements had been made for the manufacture of a small number which would shortly be put on trial

Standard Voltages.

On March 5th, Sir R. Thomas asked the Minister of Transport if he would state how many and what standard voltages it was proposed to adopt for lighting in the Metropolitan area and in the provinces, as a result of the reforms undertaken by the Electricity Commission.

Colonel Ashley said he understood that the Electricity Commission hoped to see the eventual adoption throughout the country of a standard supply at 230 V for lighting purposes.

Overhead Lines in the Lake District.

On March 4th, Mr. Pethick-Lawrence asked the Minister of Transport whether he was aware that considerable public objection had been taken to the proposed electric power-line from Penrith to Whitehaven *via* Keswick; whether he was aware of any demand for it in Keswick; and whether, with a view to the preservation of the character of the Lakeland scenery, he would consider an alternative route passing to the north of Skiddaw.

Colonel Ashley said that no application had yet been made by the Central Electricity Board for his consent, which was necessary before the line referred to could be erected. In the event of such an application being made the local authorities would be given an opportunity to be heard and careful consideration would be given to any representations which they might have to make.

Supply Companies' Bonus Shares.

On March 5th, Mr. Wellock asked the Minister of Transport whether he was aware that many electricity distributing companies which enjoyed monopoly powers, in addition to paying reasonable dividends, distributed large reserves in the form of bonus shares; and whether in view of the high cost of electricity in many areas, he would inquire into the matter.

Colonel Ashley said he was aware that certain electricity distributing companies had capitalised their undistributed profits. As regarded the last part of the question it was open to the local authority concerned or the consumers, if they were of opinion that a company's profits were excessive, to apply for a reduction in the maximum charges authorised by the Act or Order relating to the particular undertaking.

Telegraph Losses.

On March 5th, Sir J. Power asked the Postmaster-General if he could state the total loss on the telegraphs, on the basis of the commercial accounts, since they were nationalised; and which was the latest year in which a profit was earned.

Sir W. Mitchell-Thomson said that commercial accounts were not prepared before April 1st, 1912. It was estimated that during the period 1870 to 1912 the total loss amounted to approximately £21,800,000, of which interest charges accounted for about £12,500,000. From April, 1912, to April, 1928, the loss amounted to approximately £24,000,000, including about £5,000,000 for interest charges. The last year in which a surplus was shown was 1871, when the accounts were not on a commercial basis.

Central Board Capital.

On March 7th, Mr. Kelly asked the amount of capital raised by the Central Electricity Board under the Electricity (Supply) Act, 1926.

Col. Ashley said that the Board informed him that it had so far issued no loans under the Act referred to, but had met its requirements by temporary borrowing.

Rural Electrification.

Some Recent Suggestions and Recommendations.

FOR some time past the Parliamentary Conservative Party's Agricultural Committee has been considering the development of electricity supply in rural areas, and at its weekly meeting on March 5th at which the Minister of Transport, Lieut.-Col. W. Ashley, and the chairman of the Electricity Commission, Sir John F. C. Snell, attended, the Committee submitted the following suggestions for their consideration, namely, that (i) a further review of the Overhead Lines Regulations should be undertaken with a view to the reduction of the cost of such lines for serving sparsely populated areas; (ii) a standard form of wayleave agreement should be issued without further delay; (iii) different classes of construction should be authorised to meet the varying needs of rural districts; (iv) wayleave inquiries should be held promptly and inspectors empowered to announce decisions on the spot in cases governed by well-established precedents, otherwise decisions to be made known within 14 days; (v) when objections are lodged deposits should be made by both parties, forfeitable in the event of the objection being frivolous; (vi) the attention of local authorities and small-holding and road committees should be drawn to the need of avoiding delay in granting facilities for overhead line construction; (vii) steps should be taken to electrify on Continental lines a typical rural area experimentally at a cost not exceeding £250 per mile of overhead line; (viii) as in Sweden, a representative of rural interests should be appointed to the Electricity Commission and a special section of the latter devoted to the consideration of rural matters; (ix) they should consult bodies interested in the preservation of the amenities of the countryside.

Lieut.-Col. W. Ashley, in reply, stated that the steps recommended in (vii) were about to be taken, and suggestion (viii) was receiving special attention.

Sir John Snell answered technical questions.

At the National Conference on Agriculture held in London recently a resolution was carried which declared that the economic reconstruction of rural England necessitated immediate and widespread development of electricity supplies in rural areas, and that it was desirable for representatives of local branches of the National Farmers' Union, other agricultural organisations, and the electricity supply undertakings to meet in conference and discuss the possibilities of providing a supply in each of their particular areas. Copies of the resolution were forwarded to the Ministries of Transport and Agriculture, the Electricity Commissioners, the Central Electricity Board, the British Electrical Development Association, the National Farmers' Union, and other agricultural organisations concerned.

Mr. R. Borlase Matthews (Rural Reconstruction Society), in moving a resolution in support of the contention that an ample supply of electric power was of the utmost economic importance to agriculture, detailed the experience of small farmers who had saved labour and money by employing electricity, even when paying 4d. per kWh for it. In the case of a 70-acre farm which could hardly be described as all-electric, 755 kWh was consumed in 12 months at a cost of £11 15s. and the labour required to operate the electrically-driven machinery was £17 11s. 6d. Thus even with the minimum of equipment a gross profit of £26 16s. 6d. was made; the cost of the installation was about £121, so that after allowing for interest and depreciation charges at 15 per cent. there remained a net profit of about £8 15s.

At the Institution of Mechanical Engineers in London on March 8th Mr. R. Borlase Matthews exhibited a kinematograph film that illustrated the many uses to which electricity can be put on a general farm, the greater part of it having been photographed on his own 600-acre farm, which is all-electric.

Reviews.

The "All-Europe Three." By C. M. R. Balbi, A.M.I.E.E., A.C.G.I. Pp. 24; illustrated. With working drawings. London: Sir Isaac Pitman & Sons, Ltd. Price 6d. net.

The electrical engineer is often hard put to it to answer the question: "What set shall I make to obtain good loud-speaker reception over Europe?" Mr. Balbi gives him an easy answer: "Buy Pitman's sixpenny pamphlet and construct the All-Europe Three," and it is not only an easy answer, but a good one as well. The receiver consists of a high-frequency stage and a detector, followed by a low-frequency power valve. A screen grid valve is used in the high-frequency stage. The low-frequency amplifier is transformer coupled, and can be modified to take a pentode if desired. Two-wave coils are used for tuning, which saves coil changing. The set is, in fact, designed on up-to-date lines, and good components are specified throughout. Mr. Balbi has tested the set and finds that it will give good loud-speaker reception from twenty to thirty stations, that it will cut out the local station without difficulty, and, a most important item, that it will meet the requirements of the new regional scheme.

The make of every component, down to the terminals, is definitely specified, and this, we consider, is essential if results are to be guaranteed; but we think that Mr. Balbi might have been less dogmatic in giving his reasons for recommending some of the components, *e.g.*, such expressions as "as they are the best" savour somewhat of advertisement, though no doubt this is not intended.

Constructional pamphlets of this kind hardly ever give information of the cost of the set, and where every component is specified, as in this case, we think it would be a distinct advantage if prices were mentioned. After all, the cost of the set is of supreme importance to the constructor. In this pamphlet the makers of components have inserted advertisements, but the fact remains that there is no clear indication of the cost of the set.

Details of construction and operation are clearly described, and full-size working drawings are included.

Patent Law and Practice. By A. W. Griffiths. Pp. xxvii+174. London: Stevens & Sons. Price 7s. 6d. net.

This is an interesting and suggestive book. It contains much useful information, any part of which can easily be found by means of a good index. There are chapters on what may be the subject matter of a patent, what constitutes novelty, and what amount of inventiveness or ingenuity is enough. The chapter on "The Specification" explains how this will be construed by the Court, and what matters should be guarded against. Explanations are given as to the drawing out of claims, showing what should be put in and what left out. Further on in the book the rights of the patentee are considered, and what he can do in case of their infringement, what acts constitute infringement, and what defences there may be to a legal action of this kind. There are chapters on the amendment of the specification, and the revocation and restoration of a patent, and information on other points usually dealt with in books of this nature.

We cannot agree with everything in the book. On page 13 the author refers to the decision of Lord Shaw in British Thomson-Houston Co. *v.* Charlesworth Peebles & Co., as proof of his statement that a new body cannot be patented, but only the method of manufacturing it. Lord Shaw, when giving his decision in this case, expressed disagreement with "the view that if a new material had been discovered by no new means and by no new process of production that material itself would have been a patentable article." He went on to say, "a thing discovered in ordinary trade or adventure, with no novelty or invention of means employed is not patentable." But he did not say that if a thing had been discovered "by new means" and by a "new process of production"

and "with novelty or invention of means employed," the thing would not be itself patentable. The case mentioned did not decide the point, nor has any other case decided it.

John Johnston.

Television. By Alfred Dinsdale, A.M.I.R.E. (Second Edition.) Pp. xiii+180; plates 32; figs. 38. London: Television Press, Ltd. Price 5s. net.

The first edition of this book, published some two years ago, was written in a popular manner for the "man in the street," and this second edition is enlarged and purports to cover also the further progress to date and to give more technical information with the object of making the book useful to the amateur investigator.

Some early experiments with selenium cells (Chap. II) and later ones with photo-electric cells (Chap. III) are outlined and discussed, and some diagrammatic arrangements sketched, followed by a general survey (Chap. IV) of a few more recent forms of light-sensitive devices and some experiments made with them.

Chap. V briefly describes some not very recent television apparatus and components used abroad and then in Chap. VI reverts to some of the experiments with which Baird started in England.

The elaboration of lenses employed by Baird is explained in Chap. VII, together with the complexities of multiple channels experienced by him, and this is followed by a cursory account of their use by several others with a recount of an American demonstration of the light spot system (Chap. VIII). We are here told that the latter experimenters are amongst the latest to enter the field, but conceding that after working several years they succeeded two years ago in demonstrating satisfactorily, are we expected to believe, as we are told, that so elaborate was the system used at this limited demonstration "the services of nearly 1,000 men were required"? (page 96).

Some methods of attempted synchronisation (chiefly Baird's) are related in Chaps. IX and X—without, however, any mention of the stroboscopic method that appears to lend itself so well—and the restrictions at present imposed by speed limitations are discussed in Chap. XI.

Then follows a sudden diversion (Chap. XII) namely, first the introduction of "Phonovision" by an account of the sound effects derived from the train of signal impulses and their recording on wax records (without much relative useful value), and secondly, "Noctovision" (which has not the meaning the name would imply) by the use of infra-red rays giving the spectacular but rarely applicable effect of seeing in supposed total darkness.

Chap. XIII recounts the television experimental transmissions from London to New York, and from the former to the liner *Berengaria* in mid-Atlantic. A description of the successful accomplishment on a small experimental scale of television of persons in broad daylight and also of reproduction in colour by the well-known three-colour process is given in Chap. XIV, while the concluding Chap. XV similarly describes an attempt in stereoscopic relief by practically doubling the already highly elaborated apparatus.

The book as a whole deals mainly with some of the experimental work of Baird in England, and appears to support the pursuit of the glittering prizes of mere experimental achievement of one refinement after another, without deploring the apparent lack of endeavour first to consolidate each step as it is won, into a practical step forward, before passing on to still greater embellishments.

Little mention is made of the progress attained by several promising workers in the field abroad. The illustrations are good, but the diagrams are sketchy and essential data necessary to the serious investigator is almost completely absent. Mistakes occur, such as in the third paragraph page X, and the statement on page 174—and repeated on page 175—that the distance between two human eyes is approximately 4½ in.

The book furnishes good reading on an exceptionally interesting subject; the explanations are lucid and the expressions clear, and it is well worth perusing at leisure.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

Central Electricity Board Contracts.

In our last issue we drew attention to an announcement by Sir Andrew Duncan at the British Industries Fair that the Central Electricity Board intended to place contracts to the value of £3,000,000 immediately. We have now received from the Board some details of these contracts, which are given below:—

South-East England Scheme.—(1) Contracts for 66-kV and other cables in the London area: British Insulated Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; and the Pirelli-General Cable Works, Ltd.

(2) Contract for 66-kV switchgear in the London area: British Thomson-Houston Co., Ltd.

Central England Scheme.—(1) Contract for 132-kV overhead transmission lines: Balfour, Beatty & Co., Ltd.

(2) Contract for 132-kV outdoor switchgear: General Electric Co., Ltd.

North-West England and North Wales Scheme.—Contract for 132-kV overhead transmission lines: Foundation Co., Ltd.

In our advertisement columns to-day the Central Electricity Board invites tenders for the following:—Central Scotland Electricity Scheme, 1927—Supply, delivery and erection of electricity meters

The Gasfilled Lamp Patent: Extension Application.

The British Thomson-Houston Co., Ltd., has applied to the High Court for an extension of five years of the patent No. 10918, dated May 8th, 1913, granted to it in respect of an invention of "Improvements in Incandescent Electric Lamps." This is the gasfilled lamp, or, as it was known for many years (and still is), the "half watt" lamp. The originating summons is to come before Mr. Justice Luxmoore on April 9th for directions as to the hearing. Persons desiring to be heard in opposition are required to give at least seven days' notice at Room No. 175, Royal Courts of Justice, and serve copies of their notice of opposition upon the Solicitor to the Board of Trade and upon Messrs. Bristows, Cooke and Carpmael, 1, Copthall Buildings, London, E.C.2.

Nottingham Electrical Contractors' Dinner.

The annual dinner of the Nottingham branch of the Electrical Contractors' Association was held at the Black Boy Hotel, Nottingham, on March 7th, under the chairmanship of Mr. E. A. Harvey. The principal guests were the Lord Mayor of the City (Alderman A. R. Atkey) and the Sheriff (Alderman W. Green). Both of these gentlemen urged the necessity for contractors to prevail upon those who were responsible for the building of new houses to make provision in all cases for electricity supply. Mr. E. G. Phillips, expressed regret that the proportion of members on the National Register in the Nottingham area was less than in any other part of the country, this being a matter which he suggested required very careful consideration. Mr. J. Orringe, chairman of the Midland Section of the Association, observed that their relations with trade unionists were very satisfactory. The Association was interested in the question of apprenticeship. In the Midlands every youth was indentured for five years and in that way they felt they were helping the trade unions; there were too many unqualified men doing electrical work. In Nottingham the heating and cooking charges were a penny per kWh and there was an enormous scope in that direction for business, it being the duty of contractors to obtain customers.

Unemployment in Germany.

The Berlin correspondent of *The Times* reports that the German unemployment returns for the first half of February gave the total number of persons in receipt of relief as 2,455,000, as compared with 2,350,000 on January 31st. This is a smaller increase than was recorded in the previous month. It is believed that the seasonal increase in unemployment, accelerated this year by the abnormal weather conditions, has reached its summit, and will now, with the return of milder weather, begin to decline.

American Electrical Goods in Germany.

In a recent article on the German market, *Commerce Reports* states that sales of American electrical equipment are somewhat limited by the licensing arrangements between German and American manufacturers, but there is, nevertheless, an increasing sale of American fractional h.p. motors, electrical refrigeration equipment, washing and ironing machines, and vacuum cleaners.

The Easter Holidays.

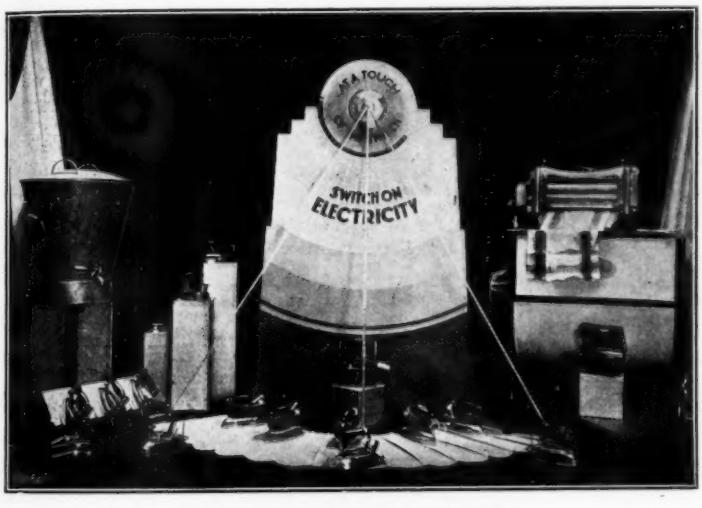
The Electrical Review for March 29th will be published on the morning of March 28th, owing to the following day being Good Friday. Our Advertisement Department announces that it will require new copy (with blocks) by Wednesday morning, March 20th. Official notices and small prepaid advertisements can be accepted up to 5 p.m. on Monday, March 25th.

The Business Delegation to Russia.

A further meeting in connection with the visit to Russia of representatives of British industrial firms was held in London last week. Mention was made of the friendly and businesslike reception of the proposal by the Russian Government, and Mr. L. E. Mather (Mather & Platt, Ltd.) proposed a resolution confirming the suggested visit, and said that definite arrangements had been made by the Anglo-Russian Committee for the delegation to leave London on March 25th. The resolution further expressed satisfaction with the attitude of approval taken up by certain of the largest British banks and financial houses. The resolution was passed unanimously

E.D.A. Activities.

During March the British Electrical Development Association's efforts are being directed mainly towards the popularisation of labour-saving devices. Following the usual practice, special advertisements are being inserted in numerous national newspapers and journals, while electros of three telling announcements are available to contractors and dealers for local newspaper advertising. An effective poster in seven



An E.D.A. Display for March.

colours can also be obtained at a low price, as well as lantern slides for lectures and demonstrations. Two special window displays have been prepared, both of which deal with electricity in the washing of clothes. One of these displays is illustrated herewith. In addition to all these special aids there are many appropriate E.D.A. pamphlets available for distribution. These are detailed in the Supplementary Programme for March which has been circulated.

Unemployment.

There was a decrease of 66,130 in the number of registered unemployed during the week ended February 25th. The total at that date was 1,391,900, as compared with 1,458,030 on February 18th and 1,108,676 on February 27th, 1928.

Philips's Activities in Germany.

It is announced from Amsterdam that the N.V. Philips Gloielampenfabrieken has acquired the majority of the shares in the J. Karger Fabrik für Werkzeug Maschinen, Berlin. As a result of the great extension of the Dutch company's activity at Eindhoven and the fact that it has an insufficient supply of trained mechanics it is no longer possible for the company itself to produce the many machines which are used in manufacturing; and it has also not been possible to obtain these machines in a satisfactory measure in Holland.

Industrial Conferences.

On Wednesday last week there was an informal discussion between Mr. Walter Citrine, secretary to the General Council of the Trades Union Congress, and representatives of the Federation of British Industries regarding the Federation's proposal that consultations should take place between the two bodies on questions affecting them both. It is expected that the first meeting will be held in a week or two.

At a meeting of the "Melchett-Turner" conference, held in London on Tuesday last, an interim report on unemployment was considered.

Recent Contracts.

An order has been received by the Hart Accumulator Co., Ltd., for a battery of 64 "JTPL" type cells, on behalf of the King of Hejaz.

The Brighton Corporation Electricity Department has ordered from Messrs. Yarrow & Co., Ltd., two boilers, each of 75,000 lb. per hour capacity and for 350 lb. per sq. in. working pressure. These boilers will be equipped with Yarrow superheaters, economisers, and airheaters. The Brighton undertaking is already employing two Yarrow boilers.

The English Electric Co., Ltd., has received an order from the Aberdeen Corporation Tramways for 56 "DK.108 C." 50-h.p. tramway motors, 56 controllers and circuit-breakers, twelve sets of cables, lightning arrestors and ampere-hour meters. This is the third repeat order from Aberdeen Corporation which the company has received for this type of tramway equipment.

A few months ago the Ashford (Kent) U.D.C. equipped its generating station with what was then the largest solid injection oil engine ever made in this country. This was an 8-cylinder "Paxman" cold-starting "spring injection" engine. The Ashford Council has now ordered from Messrs. Davey, Paxman & Co., Ltd., an even more powerful engine of the same type. This second engine will be almost identical to the 1,500-b.h.p. engine that the Basingtoke U.D.C. is about to install for the same purpose.

Trade Factors in Argentina.

Industrial electrical appliances are supplied to Argentina by every country in the world manufacturing such equipment, and the market is highly competitive. The greater part of the equipment now installed has been furnished by Germany, Great Britain, and the United States. Although the official import statistics do not classify industrial electrical machinery definitely enough to indicate the relative position of these countries, Germany is believed to be in the lead. American electrical machinery is considered favourably because of its quality, but large purchases of European equipment are made on the basis of price or nationalistic sentiment. Practically the only method feasible in the sale of this equipment in the Argentine market is through a factory branch or the established electrical-equipment supply houses in Buenos Aires, which have well-organised technical and sales staffs and branches or sub-dealers in other principal Argentine cities.—*Commerce Reports.*

According to the *Journal* of the British Chamber of Commerce in the Argentine Republic, there are wide margins of expansion open to services and industries in Argentina which already have a firmly established footing, the telephone service being one of the notable cases in point. "Telephones and electrical apparatus will undoubtedly figure very heavily in Argentina's import trade figures during the next ten years, and the factor of capital control over the services and enterprises operating in the corresponding spheres will play a very important part in the determination of the destination of the orders for the apparatus and material which will be required in increasing quantities." The value of imports of electrical materials during the first half of 1928 was, in tariff figures, 5,263,390 dollars gold as compared with 3,857,191 dollars in the first half of 1927.

The Companies Act, 1928, and Rationalisation.

On Friday last Sir Mark W. Jenkinson, K.B.E., finance director of Vickers-Armstrong, Ltd., gave an address on "The Companies Act, 1928, as it affects the Business Man" to members of the Rotherham Chamber of Commerce. In this address the main features of the new Act were admirably summarised, particular attention being drawn to the changes in company law which it introduced. The main headings were: "Directors," "Prospectuses and Offers of Shares for Sale," and "Balance Sheets and Accounting."

In the evening of the same day Sir Mark Jenkinson read a paper on "Some Aspects of Rationalisation" before a representative meeting of bankers and accountants at Sheffield. This dealt not only with the actual construction and financing of merger companies, but also with many of the effects of "rationalisation," including its influence upon the relations between capital and labour. The conclusion was reached that "Rationalisation of industry is the co-operative movement of those engaged in a particular industry to win back for that industry a paramount position in the world's trade, and by good will, good work and good brains success can be attained." These two addresses are published in booklet form by Gee and Co. (Publishers), Ltd., Kirby Street, E.C.1.

Rumoured Transatlantic Cable Merger.

Notwithstanding semi-official denials, Wall Street believes that the long-discussed merger between the Western Union Telegraph Co. and the Radio Corporation of America is approaching consummation. This combination would form one of the most extensive communication systems of the world. Recently negotiations were reported to have been postponed on

account of fears that such a deal might violate the provisions of the White Act, which is designed to prevent mergers calculated to lessen competition. It is now thought possible that in order to complete the merger, the Western Union Telegraph Co. may create a new company or separate its cable business from its land-line operations.—*Reuter* (New York).

Registered Electrical Contractors.

The Executive Committee of the National Register of Electrical Installation Contractors, at its meeting on March 1st, accepted applications for registration from the following:—

Kay & Morris, Preston.
Graham & Zebedee, Belfast.
Young, N., Amble, Northumberland.
Ryan, L. R., Marlow, Bucks.
Ainley, J. R., Leeds.
Aspin, J. A., Colne, Lancs.
Smith, H. C., Leeds.
Engineering Works (Electrical & General), Ltd., London, E.C.2.
Collins & Sharp, Leeds.
Brown & Roberts, Barnsley.
Peat, H., Leeds.
Gray, James, & Son (Ironmongers & Electricians), Ltd., Edinburgh.
Yewdall, H., Leeds.
Taplin, H. C., & Sons, Southampton.
Pritchard, A., & Co., Lye, nr. Stourbridge.
Leonard, V., Belfast.
Chapman & Inman, Stockton-on-Tees.
Brentwood District Electric Installations, Ltd., Brentwood, Essex.
Lucas, A. W., & Co., Birmingham.

At the same meeting 14 applications were declined.

Italian Foreign Electrical Trade.

The appended table shows the Italian imports and exports of electrical machinery and apparatus during the past year, as compared with 1927. The values have been converted to sterling at an exchange rate of 92.70 lire to the £. It will be seen that while the imports show an increase of £541,905, there was a drop in exports of £4,074:—

	Imports.		Exports.	
	1927.	1928.	1927.	1928.
	£	£	£	£
Accumulators and parts ...	17,915	33,475	34,590	38,260
Incandescent lamp bulbs ...	23,073	33,172	24	27
Electrical measuring instruments	30,870	45,235	1,194	1,400
Electrical apparatus, miscellaneous	473,888	780,367	110,470	108,422
Telegraph, telephone and radio apparatus	737,162	894,342	45,874	28,650
Electric furnace carbons ...	176,438	159,140	17,355	5,718
Insulated cables	28,192	31,308	150,745	188,039
Generators "without collectors"	222,033	224,194	11,980	13,623
Generators "with collectors"	216,622	240,876	300,742	231,177
Glass and porcelain insulators	20,934	16,955	4,061	16,220
Arc lamps	1,357	586	—	—
Incandescent lamps	361,430	429,430	31,750	79,477
Static transformers	62,722	58,815	16,124	9,030
Insulating tubes	460	379	1,290	3,222
Electricity meters	160,322	12,576	8,380	3,160
Insulated wire	27,013	33,526	49,405	53,465
Totals ...	£2,560,421	£3,102,326	£783,984	£779,910

Bankruptcy Proceedings.

E. F. LEE (trading as Francis Newton), electrical engineer, &c., 340a, King's Road, Chelsea, S.W.—The first meeting of creditors was held last week at the London Bankruptcy Court, the debtor having filed his petition on February 22nd. He states that he commenced business in partnership with another person as builders and electrical engineers. The business proved very poor and was insufficient to carry two partners with the result that in July last the partnership was dissolved. The debtor took over all the assets and liabilities paying his partner £25 on retirement and had since traded alone. Owing to the pressure of creditors he closed the business on February 16th last. He attributes his failure to bad debts, heavy overhead expenses, and bad trade. The case was left with the Official Receiver as trustee, the debtor's statement of affairs showing liabilities of £372 and assets £60.

H. C. BUCKLEY, electrician, 23, Asylum Road, Old Kent Road, S.E.—The public examination of this debtor was held at the London Bankruptcy Court last week before Mr. Registrar Warmington. The debtor failed last January with liabilities of £1,932 and assets "furniture, £6 10s." The Official Receiver reported that the debtor had failed to appear for purposes of investigation, and his statement of affairs required amendment. The examination was adjourned *sine die*.

S. HALL (E. Green & Co.), electric lamp dealer, 13, Caledonian Road, and 30, Leighton Lane, Leeds.—Receiving order made February 27th, on a creditor's petition.

T. C. WHEELER, electrician, 6, South Scarborough Street, West Hartlepool.—First meeting March 15th, at the Official Receiver's offices, 80, High Street, Stockton-on-Tees. Public examination, April 11th, at the Court House, Stockton-on-Tees.

F. E. CARE (F. E. Care & Son), dealer in electrical goods, &c., 40, Paradise Street, West Bromwich.—Receiving order made March 5th on debtor's own petition.

R. HORSFALL (Harrison & Horsfall), electrical engineer, Midland Street, Barnsley.—First meeting, March 18th, at the Official Receiver's office, County Court Hall, Regent Street, Barnsley; public examination, April 25th, at the County Court Hall, Barnsley.

S. S. KELLY, electrical contractor, 59, North Road, Durham.—First and final dividend of 1s. 7½d. in the £, payable March 18th, at 2, Sackville Place, Newcastle-on-Tyne.

J. A. DAVIES, electrical contractor, Eureka, Church Street, Blaenau Festiniog.—First and final dividend of 3s. 5½d. in the £, payable March 20th at the Official Receiver's office, St. Peter's Churchyard, The Cross, Chester.

Company Liquidations.

COUNTY ELECTRICAL & WIRELESS STORES, LTD., Garrick Yard, St. Martin's Lane, E.C.—The first meetings of creditors and shareholders were held on March 8th at Carey Street, W.C. Mr. J. Barwick Thompson, Official Receiver, reported that the winding up order was made on January 28th upon the company's own petition. The company was registered as a private company in July, 1923, with a nominal capital of £1,000, increased in 1926 to £7,000, the object being to carry on business as dealers in wireless receiving sets and parts. He understood that the formation was at the instance of Burndept, Ltd., for the purpose of dealing in apparatus manufactured by that company because the rules of the trade association prevented manufacturers from retailing their own products. The original directors, Messrs. F. T. Lane, R. J. Frost, and S. E. Wadey were all nominees of the Burndept Co., and they, with Messrs. C. Stewart and J. G. Scott, resigned at different times. Although the nominal capital was increased in 1926, only 1,000 £1 shares had been issued and they were subscribed for cash. Premises were opened at Deal in 1923, other branches being subsequently established at Folkestone, Bournemouth, Gloucester and Hythe. Although in the first few months the company restricted its sales to Burndept products, it gradually traded in other apparatus. By February, 1927, the company was indebted to Burndept Wireless, Ltd., to the extent of £6,998, in respect of moneys advanced and goods supplied. In that month debentures were created and issued to Burndept Wireless, Ltd., to secure the debt, but in the following June, Burndept Wireless, Ltd., agreed to accept £1,250 in full discharge and an overdraft was obtained from the bank and guaranteed by Mr. Monins, a director. Thereafter the company purchased the bulk of its supplies from Hambling, Clapp and Co., Ltd., of which concern Messrs. Price & Monins were directors. The trading accounts showed that during the five and a half years of its existence the sales amounted to £36,499, and the gross profit was £7,130; there was a net loss of £10,691. Another company in which Mr. Monins was interested (E. K. Development Co., Ltd.) advanced £200, and another loan of £500 was obtained at the end of 1928 from the Ever Ready Co. (Great Britain), Ltd. Shortly before the presentation of the petition to wind up the company the landlords of the premises at Folkstone, Deal, Hythe and Bournemouth distrained for rent. No statement of affairs had yet been lodged, but the liabilities were estimated at £4,319 and the assets at £614, of which £500 represented book debts. The failure was attributed by the directors to insufficient working capital. In the opinion of the Official Receiver the failure was also due to mismanagement. The company ought to have been wound up at the end of the second year's trading, by which time the whole of the capital had gone. The result of the subsequent trading was merely to increase the liabilities year by year as a net annual loss had been sustained throughout. The liquidation was left in the hands of the Official Receiver.

RADIOVISOR, LTD.—A meeting of members is called for April 9th at 26, Coventry Street, W., to hear an account of the winding-up from the liquidator, Mr. S. H. Master.

Dissolutions of Partnership.

ELECTRICAL CAR EQUIPMENTS, and EVANS & WHEELER, automobile electrical engineers, 77, Market Street, and 22, Argyle Street, Birkenhead.—Mr. S. Evans and Mr. G. B. Wheeler have dissolved partnership. Mr. Evans will attend to debts and continue the businesses.

N. R. PHELP, wireless engineers, 54, Queen's Road, Brighton.—Mr. N. R. Phelp and Mr. W. R. Pallett have dissolved partnership. Mr. Phelp will attend to debts.

MANCHESTER MAGNETO CO., magneto repairers, 51, Hardman Street, Manchester.—Mr. H. V. Barker and Mr. P. S. Clark have dissolved partnership. Mr. Barker will attend to debts and continue the business.

ROBERTS & GOULDTHORPE, mechanical and electrical engineers, Crosland Moor Mills, Huddersfield.—Mr. J. E. Roberts and Mr. H. Goldthorpe have dissolved partnership. Mr. Roberts will attend to debts and continue the business.

Private Arrangements.

A. V. CREASEY, electrical and wireless engineer, 54, High Street, Knaresborough, and 146, High Street, Bramley, Leeds. A meeting of creditors was held on March 7th, when a statement of affairs was submitted which had been prepared by Mr.

C. H. Baker, of the Manufacturers' and Merchants' Protection Association, Leeds. The statement disclosed ranking liabilities of £2,373, of which £1,663 was due to the trade. The net assets were estimated at £969, leaving a deficiency of £1,404. Mr. Baker reported that before the war the debtor was a wireman, and on his demobilisation in 1918, he started trading on his own account at Leeds, with a capital of £200. In 1924 he commenced trading at Knaresborough, and for some little time following that date, his financial position was adversely affected. His position improved in 1926. The debtor also had a shop at Ripon but it was disposed of some little time ago. In 1926 the turnover was £4,000, and in the following year it increased to £4,100 and went up to £4,500 in 1928. The deficiency was accounted for by the depreciation written off the assets in the statement of affairs, loss on old stock £100, bad debts, losses on contracts, and depreciation of wireless stock. The debtor had recently been pressed, and a deed of assignment had been executed with Mr. Baker as trustee. The creditors confirmed the deed, and a committee of three of the creditors was appointed. Mr. Baker states that the business is being continued with a view to its sale as a going concern. The following are creditors :—

	£		£
Metro-Vick Supplies, Ltd.	71	Albion Electric Stores ...	206
E. G. S. Co., Ltd. ...	315	Ellison & Hillman	39
Morley, T. B., & Co., Ltd.	33	Lewtas, H. & G. O., Ltd.	38
Credenda Conduits, Ltd.	40	Dawson, Fred	110
Brown Bros., Ltd. ...	25	Major & Co., Ltd.	25
Baxendale & Co., Ltd. ...	150	"M.P.A." Wireless, Ltd.	27
Philips Lamps, Ltd. ...	32	Ward & Goldstone, Ltd.	99
Riddiough, Frank, & Son	79	Fuller Accumulator Co. (1926), Ltd.	21
Falk, Stadelmann & Co., Ltd.	42		

Reduction of Capital.

Sir W. G. Armstrong, Whitworth & Co., Ltd., & Reduced.—A petition has been presented to the High Court for the reduction of the capital of the above named company from £11,012,500 to £1,512,812, and will be heard in London on March 18th.

New Catalogues and Lists.

Holophane, Ltd., Elverton Street, Vincent Square, S.W.1.—A pamphlet, illustrated in colour, describing the company's colour-lighting schemes for kinemas. Also a copy of "Holophane Illumination" dealing in an interesting way with the arrangement of, and equipment for, colour lighting for stage and kinema.

British Insulated Cables, Ltd., Prescot, Lancs.—A bridge score pad, each leaf of which bears a picture of the company's works or products.

Messrs. Austin Walters & Son, Ltd., Gaythorn, Manchester.—A folder advertising the company's electric sky signs.

Messrs. J. H. Tucker & Co., Ltd., King's Road, Tyseley, Birmingham.—A priced and illustrated pamphlet dealing with the company's miniature cut-out (15 A at 250 V; 10 A at 500 V); and a folder containing illustrations and prices of numerous "Tucker" switchplates in metal and moulded "Telacite."

The Drayton Regulator & Instrument Co., Ltd., West Drayton, Middlesex.—An illustrated booklet containing details and prices of the company's steam traps.

Messrs. W. Canning & Co., Ltd., 133-137, Great Hampton Street, Birmingham.—A pamphlet containing illustrations of chromium-plating equipment and examples of chromium plated work, including electrical appliances.

The Enfield Cable Works, Ltd., Lincoln House, 296-302, High Holborn, W.C.1.—A blotter illustrating the method of packing small Enfield cables.

The Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1.—A March calendar-blotter bearing an illustration of the company's "No. 46" cooking cabinet.

The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.—A folder, illustrated in colour, dealing with "Eye-Restolite" and "Luxor" lighting fittings and silk shades. Priced. Pamphlets Nos. L.459 and L.460 dealing respectively with the company's equipment for industrial lighting and shop lighting. Also a descriptive pamphlet containing full details of the B.T.H. electric freezing unit.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—Leaflet No. 282 dealing with built-in control gear for individual drives, with illustrations of actual examples.

The Universal Manufacturing Co., 7c, St. George's Circus, S.E.1.—A card bearing examples of colours in which the company's lamp colouring preparations are produced.

The Marconiphone Co., Ltd., 210-212, Tottenham Court Road, W.1.—Three new showcards advertising in an attractive manner three "Marconiphone" receiving sets.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W.1.—Brochure No. 1002 E., illustrating and describing the company's centrifugal pumps.

The Eclipse Pump Co., 65-66, Queen's Buildings, 52, Queen Victoria Street, E.C.4.—A reprint of an article dealing with the "Eclipse" automatic force and sight feed oil pump.

The English Electric Co., Ltd., Queen's House, Kingsway, W.C.2.—Publication No. 940 describing the company's oil-immersed starters for squirrel-cage motors.

The Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, E.C.4.—Catalogue No. 1324 illustrating and describing a number of industrial vacuum-cleaning installations employing Sturtevant equipment.

The Line Accessory Co., 59, Tennyson Road, Small Heath, Birmingham.—An illustrated price-list of "Linac" plugs and sockets of various patterns.

Giant's Causeway Tramway.

We have received a copy of a brochure dealing with the opening ceremony of one of the pioneer hydro-electric tramways of the world, the Giant's Causeway electric tramway, which was constructed by Mr. William A. Traill, and was opened in 1883. There is a forecast of an elevated, or overhead, electric railway by a model, 28 feet long, exhibited at the International Inventions Exhibition of 1885 in London, which received the award of a silver medal, embodying third-rail electric conductors as still used on the Metropolitan and Tube electric railways. Another forecast gave cross sections of the conduit system of street electric tramways, as described by Traill's patent of July, 1883, and used by the L.C.C. electric tramways of 1903.

Canadian Tariff Changes.

The *Board of Trade Journal* reports a number of alterations in the Canadian Customs tariff which took effect as from March 2nd. Among other things the duties on electrically operated rotary coal drills of a class not made in Canada, and coal-cutting machines are remitted. "Copper rods when imported by manufacturers for use in their factories in the manufacture of electrical conductors, the individual units of such electrical conductors not to exceed the area of No. 7/0 gauge conductor," are still to be admitted free of duty, but the Governor-in-Council is empowered to impose the following duties when he is satisfied that copper bars are being sold in the country of export at a lower price than for export to Canada :—Intermediate tariff ¼c. per lb.; general tariff ½c. per lb.

Social Events.

The annual dinner of the staff of the Bury Corporation Electricity Department was held on February 25th, under the presidency of the engineer and manager, Mr. J. G. Potts. Various toasts were honoured, including the health of Mr. T. Mahon, who was complimented on completing 33 years' service with the undertaking.

The annual fancy dress carnival, organised by the staff of the Sun Electrical Co., Ltd., was held at the Victory Hall, Leicester Square, on March 2nd, when nearly 200 of the staff and their friends attended. The costumes were, as usual, most original, the first prize being awarded to Mr. J. A. Johnstone whose characterisation of the results to be expected from a certain cheap type of tailor gave rise to uproarious hilarity. Among those present were Mr. A. G. Beaver (managing director) and Mrs. Beaver, Mr. D. M. Fraser (Leeds manager), Mr. J. K. Green (Newcastle manager), and several heads of departments. A raffle for a basket of fruit produced £5 for the Miners' Fund. The carnival was arranged by Mr. A. G. Owen.

The annual concert of the G.E.C. Choral Society was held in the Lecture Hall, Magnet House, on March 1st. A concert version of Gounod's *Faust* was rendered with fine effect. Much of the success was due to Mr. A. H. Spinks, the conductor, with Miss I. Page at the piano. The soloists were Mme. A. Glen Sidwell, L.R.A.M., Miss Hilda Burroughs, Mr. William Crowley, and Mr. Thomas Sack. The second part of the programme consisted of a number of well-rendered songs and choruses, the arrangements being in the hands of Mr. R. A. Hyde, the honorary secretary of the Society.

Continental Exhibitions.

It is stated that the thirteenth annual Swiss Industries Fair, which opens at Bâle for ten days on April 13th, shows a notable advance on previous years. Some 1,500 exhibitors have booked space. The electrical group comprises, in the main, exhibits illustrating the development of modern electrotechnics. The exhibits include automatic telephone stations, batteries, radio apparatus, stage-lighting apparatus, household electrical appliances, scientific instruments, lifting plant, welding apparatus, medical and scientific electrical apparatus, automatic switches, transformers, and numerous other articles.

A dinner was given in London on March 7th to the Committee of Honour of the British Section of the Barcelona International Exhibition, which is being held from May to December. The Spanish Ambassador, who attended, described the exhibition as one of the greatest since the war, and said that it was within 26 hours of London. It provided a chance for British salesmen to "push" their goods, and in spite of the tariff wall there was always a way for high-class goods, and British goods were always that. Sir Edward Crowe (Department of Overseas Trade) said that British exporters had lost ground in Spain, and the Barcelona Exhibition presented a unique opportunity for the regaining it.

We have received from the Italian Chamber of Commerce in London, 10, Queen Street, E.C.4, some "literature" dealing with the Milan Sample Fair (April 12th to 27th). The illustrations show this to be a well laid out exhibition, in which the various classes of goods are separately housed.

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There is an "Electrotechnics Pavilion" covering an area of 5,000 sq. metres, as well as a "Mechanical Saloon" with a floor space of 12,000 sq. metres, said to be one of the largest in Europe. A combination of pleasure with business is suggested, and special tours have been arranged by the Italian State Railways.

In the coming autumn it is proposed (according to the *Daily Telegraph*) to hold an exhibition of British industrial products in Copenhagen. It is stated by the promoters, two newspaper proprietors, that although Danes prefer to buy British goods, the imports, owing to lack of propaganda, are rather small.

Book Notices.

"Publications of the U.S.A. Bureau of Standards.—Standards Year Book, 1929. Price one dollar.—The third issue of this annual publication is a reference book, summarising and bringing up to date current standardisation activities and accomplishments in the United States of American and elsewhere since the 1928 edition.

Circular No. 374, "X-Ray and Radium Protection" (5 cents); Research Paper No. 40, "Note on a Piezo Electric Generator for Audio-Frequencies" (5 cents); Miscellaneous Publication No. 86, "Tables of Spectral Energy Distribution and Luminosity for use in Computing Light Transmissions and Relative Brightnesses from Spectrophotometric Data" (10 cents).

"Electric Traction," by Capt. M. I. Williams-Ellis. Pp. xvi+40; 23 figs. Price 6d.—This booklet, being a reprint of a paper that was awarded the Maybury Gold Medal and a fellowship of the Institute of Quarrying, deals with the application of electric traction to quarries and mines, a subject on which little has been written.

"The Daylight Transmission of Wireless Waves over Sea Water," by R. O. Cherry. Pp. 6; figs. 3. Melbourne: Broadcasting Co. of Australia.—A pamphlet dealing with the results of signal intensity measurements of the ground wave.

"The Theory of the Gyroscopic Compass and its Deviations," by A. L. Rawlings. Pp. x+191; figs. 65. London: Macmillan and Co., Ltd. Price 10s. 6d. net.

Gramophone-Radio Merger.

It was announced last week that the Gramophone Co., Ltd. ("His Master's Voice") has acquired the Marconiphone Co., Ltd., one of the subsidiaries of Marconi's Wireless Telegraph Co., Ltd. The purchase carries with it the right to use the Marconi radio patents and the "Marconi" and "Marconiphone" trade marks. It is also understood that the radio interests of the Sterling Telephone and Electric Co., Ltd., are included in the transaction, leaving the company to carry on with its telephone business. The Marconi Company is to receive a cash payment and shares in the Gramophone Co. Commenting on the matter, the *Financial News* states.—"An important feature of the transaction is that the fusion of interests establishes control in British hands. It will be recalled that quite recently the Radio Corporation of America acquired control of the Victor Talking Machine Company, 95 per cent. of the stockholders of the latter agreeing to a share exchange. Victors hold all the 'B' ordinaries of H.M.V., and with them a controlling interest. By the issue of the new shares to the Marconi Company, to what extent has yet to be disclosed, it is understood that control will be swayed into British hands by the turn of the scale."

The Marking of Imported Rubber Goods.

The Standing Committee under the Merchandise Marks Act, 1926, has issued its report on the application made by the India-Rubber Manufacturers' Association, Ltd., for an Order requiring the marking of imported rubber manufactures. (Cmd. 3281, H.M. Stationery Office, 3d. net.) The application was in respect of many classes of goods, including sheet rubber, piping and tubing, rubber gloves, ebonite, vulcanite, and manufactures thereof, &c. An agreement was reached with regard to ebonite to the effect that sheets of the material of more than 3/16 in. in thickness and four sq. ft. in area should be marked by impression in one corner. It was also suggested that in the case of ebonite manufactures the containers should be marked, if supplied by the manufacturers; the Committee, however, considers this impracticable and inexpedient. With regard to rubber in sheets it is recommended that the seller should be allowed the option of marking them by stencilling or other non-injurious means. It is recommended that rubber hose should be marked by means of a securely-attached label. The suggested methods and positions of marking are given in an annex to the report.

German Meter Manufacturers' Association.

An association of German electricity meter manufacturers has recently been formed in Berlin with the object of protecting their interests in Germany and abroad.

Visit of Commercial Secretary in the United States.

The Department of Overseas Trade announces that Mr. A. J. Pack, the Commercial Secretary in the United States, will shortly visit this country on official business. Mr. Pack will attend the offices of the department for a few days commencing on March 18th, for the purpose of interviewing representatives of United Kingdom firms interested in the exportation of British goods to the United States. He will subsequently visit a few of the principal commercial centres in the United Kingdom. Applications for interviews in London should be addressed to the Comptroller-General Department of Overseas Trade, 35, Old Queen Street, S.W.1. (Reference 12796/1.)

For Sale.

Birmingham Corporation Electricity Department has for disposal seven Babcock & Wilcox land type boilers with Underfeed stokers, &c., also two 175-b.h.p. Belliss & Morcom high-speed engines coupled to two 300-V. three-phase generators, one 15-h.p. Bryan Donkin & Clench steam engine, switchgear, piping, feed-water heater and purifier, and two 4-kW transformers. The receiver of the Chagford and Devon Electric Light Co., Ltd., invites offers for the freehold land, mill, or factory (with turbine) and buildings at Chagford, together with the goodwill of the business of electric light suppliers, including plant, &c. Exeter City Council Electricity Committee invite offers for two Babcock & Wilcox water-tube boilers with superheaters and chain grate stokers, and two Belliss and Morcom triple-expansion engines with jet condensers direct coupled to two 400-kW Westinghouse alternators. (See our advertisement pages to-day.)

Trade Announcements.

The Walsall Hardware Mfg. Co. has opened a new depôt at 39, Arundel Street, Sheffield (telephone 22844), under the management of Mr. E. P. Prior.

The business of A.F.A. Accumulators, Ltd., has been taken over by Pertrix, Ltd., 120, Tottenham Court Road, W.1. The latter company is equipping a factory at Redditch for the production of accumulators and dry batteries.

Prices of Raw Materials.

Messrs. F. Smith & Co. and Messrs. James & Shakespeare report, March 12th: No change in copper prices.

Messrs. James & Shakespeare report, March 12th: English pig lead £24 15s., 5s. dec.

Messrs. Edward Till & Co. report, March 12th: India-rubber, Para fine 1s. 1d., ¼d. dec.

In their letter dated March 9th, Messrs. James Forster and Co. stated that the main support of the lead market last week came from America and to a certain extent from the troubles in Mexico, which, if prolonged, would result in production being interfered with. Demand in this country and on the Continent is still very quiet, while actual supplies are sufficient, and with heavy shipments from Australia during January and February, prospective supplies look like being in excess of requirements. Moreover, the revolution in Mexico seems to be on the eve of collapse, so that regular shipments should be resumed from that country before long.

We have received from Messrs. Lindsay & Williams, Ltd., Ardwick, Manchester, as usual, a set of curves showing the course of prices during 1928 of raw materials for cable manufacture, *viz.*, cotton, rubber, copper and lead.

Our Foreign Electrical Trade.

The following table shows the values of exports and imports of electrical goods and machinery during February:—

	Feb., 1929.	Inc. or dec. as compared with Feb., 1928.	2 months 1929. Inc. or dec.
Exports—	£	£	£
Electrical goods and apparatus	950,588	−41,426	− 36,175
Machinery	4,107,637	+35,750	+308,340
(Inc. electrical machinery)	511,777	+21,589	+ 83,948
Imports			
Electrical goods and apparatus	388,036	+47,888	+ 64,671
Machinery	1,234,671	+16,251	+299,054
(Inc. electrical machinery)	120,780	−19,596	− 11,038
Re-exports—			
Electrical goods and apparatus	12,776	− 125	− 3,146
Machinery	118,933	− 4,007	+ 480
(Inc. electrical machinery)	8,624	+ 751	+ 1,162

Lighting and Power Notes.

Accrington.—New Cables.—The Corporation Electricity Committee has approved schemes for the laying of cables to the Blackburn boundary at a cost of £1,148.

Australia.—New South Wales.—The N.S.W. Government has put in hand the construction of a dam on the Lachlan river at Wyangala, 30 miles above Cowra. According to the *Electrical Engineer of Australia and New Zealand*, this dam will impound water to be used for the development of mixed farming over a large area along the Condobolin to Broken Hill railway line, and will regulate the flow of the river so as to improve the water supply to properties along nearly 800 miles of river and creek frontage. The dam will be of concrete,

with profile generally similar to that of the Barren Jack dam. It will impound 273,694 acre-ft. of water, to a maximum depth of 160 ft. It is proposed to build a hydro-electric station on the downstream side of the dam as part of the structure itself. This will house two 7,000-h.p. generating units and will supply energy for the surrounding towns and districts. The transmission system will link in with the Barren Jack system to the south and will also tie in, by means of a transmission line through Blayney, with the N.S.W. Railways Commissioners' steam power station at Lithgow. The Commissioners are already contemplating the construction of a line to supply Bathurst and Orange from Lithgow, and this will be used as part of the link. The tying-in of the Barren Jack and Wyangala hydro-electric stations with the Lithgow steam station will ensure reliability of supply.

Barnstaple.—New Plant.—The Town Council has decided to install another 300-kW Diesel set at the electricity works in the spring of 1930.

Bebington & Bromborough.—Street Lighting.—The Birkenhead Corporation Electricity Committee has arranged terms with the Urban District Council for street lighting in the district.

Caernarvonshire.—School Lighting.—The Clerk of Works of the County Education Committee has prepared a statement as to the cost of gas and electricity in one of the Council schools during a period of four years. For the four years when gas was used the cost was £55, and for the four years during which electric lighting was used the cost, including repairs, was £19. The Committee has decided that it is desirable that, wherever possible, schools in the county be lighted by electricity.

Canada.—Electrical Development.—A power development scheme on an exceptionally large scale is stated to be under consideration for the Abitibi River, north of Cochrane, Ontario. At the present time a preliminary survey is being made by Messrs. Morrow and Beatty, and the Abitibi Power and Paper Company, Ltd., it said to be interested in the plans. The site of the proposed development is close to Mile 70, on the James Bay branch of the Temiskaming and Northern Ontario Railway, in the vicinity of the Abitibi Canon, where four rapids provide a drop of 130 ft.

According to the *Financial News of Western Canada* the Power Corporation of Canada, Ltd., is shortly to undertake the construction of electrical utilities at Prince Rupert and Stewart costing between $2,500,000 and $3,000,000 during the current year. The municipal power plant at Prince Rupert, where 3,000 h.p. is at present developed, is likely to be acquired, the plant being extended in order to provide for the generation of 25,000 h.p. in anticipation of the development of new industries in the neighbourhood. Within 40 miles of the City are power sites on the Khatada, Oxtall and Brown's rivers.

Hydro-Electric Development.—In the House of Commons on March 8th, the Minister of Public Works, announced that the Government would sanction the application of the Beauharnois Power Company for approval of plans for a power canal seventeen miles in length on the St. Lawrence River above Montreal, involving the diversion of forty thousand cubic feet per second of the river flow sufficient for the initial development of 500,000 h.p., with a probable ultimate development of two million h.p. The company will immediately proceed with the development involving an initial expenditure of approximately 60 million dollars during the next three years, and also the contemporaneous establishment of many important new industries backed by Canadian, United States and British capital. The new industries will include electro-chemical and electro-metallurgical works in which British capital will be largely involved.—*Reuter* (Ottawa).

Colchester.—Plant Extensions.—The Corporation is to apply for sanction to the borrowing of £28,710 for the following extensions at the power station:—One 3,750-kW turbo-alternator with Lea recorder equipment, &c., £11,500; steel-cased cross-type marine boiler with accessories, £10,390; switchgear, £1,400; pipework and accessories, £2,500; foundations, &c., £1,550; engineer's fees, &c., £1,370. Subject to loan sanction, tenders have been accepted.

Continental.—Russia.—A committee appointed by the Central Electricity Department of the Soviet Government has reported in favour of the construction of a new power station to serve the industrial district of Leningrad. Recent extensions made to the existing stations have proved insufficient, and it is proposed to erect a station with a capacity of from 100,000 to 150,000 kW. The fuel used will be peat, of which there are ample supplies near Leningrad. Plans prepared by the technical expert, M. Speranski, provide for the erection of the new station at Malain-Vichera. Negotiations are said to be in progress with the American General Electric Co., for the work to be done at a cost of $25,000,000. The company will not only supply the plant but undertake part of the constructional work as well.

Dunoon.—New Undertaking.—The Town Council on March 5th approved the adjusted agreement between the Council and Messrs. Johnson & Phillips, Ltd., who are to establish an electricity undertaking in the town, costing £40,000.

Eastbourne.—New Sub-station Plant.—The borough electrical engineer has recommended to the Electricity Committee the erection of three new sub-stations at a cost of £2,184, and the installation of additional plant at five existing sub-stations at a cost of £1,505.

Loan.—The Committee is applying for sanction to a loan of £4,058 for mains extensions.

Epsom—Extensions or Bulk Supply.—At a recent meeting of the Urban District Council it was intimated that if sanction was not received soon for the installation of the second Fullager set, the electricity undertaking would not be able to cope with the demand for electricity in its area next winter. The Council had received an offer of a bulk supply from the London and Home Counties Joint Electricity Authority, but did not consider that that supply could be available in time to meet the fast-growing load.

Gloucester.—Loan.—The City Council has applied for sanction to a loan of £7,029 for a h.p. feeder and distributing cables to be laid in Stroud Road.

Grampians.—Amendment of Bill.—As a result of an important concession by the promoters of the Grampian electricity supply scheme, the joint opposition by Banffshire County Council and a number of the burghs in Banffshire, Aberdeenshire, and Kincardineshire may be withdrawn. The town clerk of Banff has been in consultation with the promoters in London, and they have agreed to add a clause to their Bill which requires them to submit their proposals to the Electricity Commissioners within three years, these proposals to be carried into effect within a time prescribed by the Electricity Commissioners. The Bill as it stood allowed five years for commencement and ten years for completion of the work. The town clerk adds that the promoters assured him that it was their hope and intention to supply electricity throughout the petitioners' areas considerably earlier than three years. They further indicated that they were prepared to be distributors of electricity to consumers direct, as well as suppliers of electricity in bulk, and that as such distributors they would supply at the price of 8d. per kWh as a maximum for lighting.

Guatemala.—Electrical Development.—It is proposed to augment the electrical plant at Coatepeque, Department of Quezaltenango, in order to serve Retaluleu and Ayutla, in the Department of San Marcos, close to the Mexican border. The bulk of the electricity provided at present is consumed by the owners, the International Railways of Central America, leaving an insufficient amount for general distribution.—*Reuter's Trade Service* (Guatemala City).

Hull.—Loan Sanctioned.—The Corporation Electricity Committee has received sanction to borrow £4,498 for works in connection with the supply of electricity to the Brough Aerodrome.

Irish Free State.—Cork.—At a recent meeting of the Council of the Cork Incorporated Chamber of Commerce, it was decided to ask the City Commissioner to make a request to the Electricity Supply Board to hold an inquiry regarding the charges for electricity made by the Cork Electric Supply Co., Ltd.

Killarney.—At a recent meeting of the Urban Council, the Town Clerk was directed to communicate with the Electricity Supply Board on the subject of the high price charged for electricity in the town, *viz.*, 10d. per kWh, and to request the Board to compel the Kerry Electric Supply Co. to reduce its present charges.

Shannon Scheme.—In Dail Eireann, on March 6th, the Parliamentary Secretary to the Ministry for Industry and Commerce, said that the total amount paid up to February 1st, 1929, to the contractors of the Shannon scheme was:—Civil constructional works, £2,140,557, and electrical and mechanical work, £1,428,904, making a total of £3,569,462. The amount which would accrue for payment on completion of the works could at present only be estimated. The sums would approximately be:—Civil constructional work, £2,897,000; electrical and mechanical work, £1,906,000; total, £4,803,000. This amount and the previous total made about £8,372,462 for the whole scheme.

Leyton.—Change-Over.—The Town Council is to change over the system of electricity supply from d.c. to a.c. in the Cann Hall area at a cost of £25,000, and has accepted the tender of the Power Lines Construction Co., Ltd.

Maidstone.—Loan.—The Town Council has applied for sanction to a loan of £3,000 for the provision of electrical apparatus to be let out on hire.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Beckenham.—"All-in" tariff: From 10 per cent. to 8 per cent. on the first £75 of ratable value, and from 4 per cent. to 3 per cent. on the ratable value above £75. Power: To consumers not using an electric cooker, from 1½d. to 1d. per kWh during the summer quarters, and to those using cookers, from 1d. to ¾d. per kWh.

Reigate.—Lighting: From 6d. to 5½d. per kWh. Heating: From 2d. to 1d. per kWh. Cooking and power: From 1½d. to 1d. per kWh.

Padiham.—In houses with a ratable value under £15, the rate of 6d. per kWh for lighting is reduced to 2d. per kWh for all electricity in excess of 60 kWh during the winter quarters, and 20 kWh in the summer quarters. The same reduction is to apply where the ratable value exceeds £15, but is under £25, for electricity in excess of 80 kWh in the winter quarters

and 30 kWh in the summer quarters. Where the ratable value is over £25 the reduction will apply to electricity in excess of 140 kWh during the winter quarters, and 50 kWh during the summer quarters. Electricity for domestic heating and power is being reduced in similar ratio.

Wallasey.—Lighting: From 4½d. to 3¾d. per kWh, with a discount of 5 per cent. for prompt payment of accounts.

Cheadle and Gatley.—Ordinary lighting, within the district: From 6¾d. to 6d. per kWh; outside the district, from 7d. to 6½d. per kWh. "All in" rate: From 25 per cent. on the rateable value, with a minimum of £6, to 20 per cent., with a minimum of £4, plus 1d. per kWh. Slot meters: From 9d. to 8d. per kWh.

Preesall (Lancs.).—Assisted Wiring Scheme.—The Urban District Council has decided to embark upon a scheme to encourage electrical installations in private houses by means of a deferred payment system. The cost of the wiring installations will be met by a charge of 1s. per lamp per quarter until the capital outlay and interest are liquidated.

Rochdale.—Electrical Progress.—The Corporation Electricity Committee hopes to be able, at the end of this month, to report a surplus of £11,000 on the year's working of the electricity undertaking. One contributory factor has been the increase of about 65 per cent. in the use of electricity for domestic purposes. It is thought that the output for the year will be 80,000,000 kWh, representing an increase of 20 per cent. Of the estimated surplus, £5,000 will be put aside for new showrooms and stores.

Special Orders.—Application has been made to the Electricity Commissioners for a Special Order by Messrs. Thomas Wilkinson (Arnside) Ltd., authorising them to supply electricity in the borough of Appleby, the urban districts of Kirby Lonsdale, Shap and Carnforth, the rural districts of East Westmorland and West Ward, and parts of the rural districts of South Westmorland, Lancaster, Lunesdale, and Sedbergh.

The Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Liskeard Gas and Electricity Co., Ltd., to supply electricity in the borough of Liskeard, and Manchester Corporation to supply in part of the rural district of Bucklow.

Sheffield.—Loan Sanctioned.—The Corporation Electricity Committee has received sanction to borrow £49,897 in respect of feeder mains, and is to extend mains at a cost of £6,500.

Stamford.—Purchase of Undertaking.—The Town Council has decided to give notice to purchase the undertaking of the Urban Electricity Supply Co., Ltd., and to seek the permission of the Electricity Commissioners to carry this decision into effect.

Torquay.—Electrical Development.—At a meeting of the Town Council on March 5th, the Electricity Committee stated that the question of acquiring new premises for showrooms had been considered, but it had decided to proceed further with negotiations with the contractors before coming to any decision regarding the purchase of new premises. The cost of the showrooms was estimated at £15,000.

The Committee also submitted an assisted wiring scheme under which the work of installation would be let to contractors at a price to be fixed by the Council. Houses in streets where the cables were already laid would be dealt with first, and mains would be laid in other streets afterwards. The Committee recommended the Council to approve the principles of the scheme and stated that a further report and estimate would be presented in due course as to the sum required to set it in motion.

In connection with the purchase of the electricity undertaking at Buckfastleigh, the Teignmouth Electric Lighting Co., Ltd., has been requested to furnish more detailed particulars of the assets and financial position of the undertaking.

It was reported that from March 31st, 1928, to the end of January last, the electricity generated at the Council's works at Newton Abbot amounted to 14,232,036 kWh, an increase of 2,711,542 kWh, as compared with the corresponding period of the preceding year. The Committee's recommendations were adopted.

United States.—Electrical Development.—According to the *Electrical World*, construction of the James H. Reed 60,000-kW power station, to be built on Brunot Island, Pittsburgh, for the Duquesne Light Company, has been commenced, and orders for the major equipment, including three boilers, have been placed. The station will ultimately house another 60,000-kW generator and three more boilers. Construction work will continue through 1929, and the station will be completed in the summer of 1930.

Recommendations for the immediate expenditure of $2,950,000 for new equipment in the Kansas City (Kan.) municipal power station and expenditure of $7,600,000 by 1942 has been made to the City Commissioners in a report based on a survey made by Mr. A. L. Mullergren, consulting engineer, more than two years ago and recently revised. The programme would raise the capacity of the plant from 19,000 kW to 40,000 kW at first, and eventually to 100,000 kW.

Walsall.—Electricity Supply.—The Corporation Electricity Committee has authorised the expenditure of £17,000 for mains and sub-station extensions.

West Ham.—Loan Sanctioned.—The Electricity Commissioners have sanctioned the borrowing of £19,081 by the Corporation for the extension of the generating station, as follows: Buildings, £2,000; switchgear, £7,575; cooling towers, foundations, &c., £2,323; superstructure and pipework, £7,163.

Tramway and Railway Notes.

Aberdeen.—Track Renewal.—The Corporation Tramway Committee has decided to spend about £19,600 on the renewal of the track in King Street and portions of the beach route.

Colchester.—Abandonment of Tramway.—The City Council is to apply to the Ministry of Transport for an Order authorising it to discontinue the tramway services from North Station Road to London Road, and from High Street to East Gates.

Continental.—Belgium.—The report of the Société des Tramways Bruxellois of Brussels for last year, which has just been issued, shows that the receipts from all sources amounted to £1,051,725, and the gross expenditure to £936,719, leaving a net profit of £115,006, as against £79,773 in 1927. Both the number of passengers carried and the number of car-miles run increased, and in order to provide for the growing traffic, the company has ordered 50 new motor-equipped and 200 large capacity trailer cars, which will be put into service during the present year. Several new lines were completed during 1928, and the company's reserve electricity stations have been connected up with the distribution mains of the other power stations in the Brussels area. The existing sub-stations have been modified, eleven mercury rectifiers are in course of installation, and about 20 miles of h.p. and 6¼ miles of l.p. feeders have been laid.

Switzerland.—The Swiss Federal Railways, at their last general meeting, passed the plans for the construction and electrification of a double section of line between Richterswil and Pfaeffikon, in the canton of Schwytz, and voted a credit of 4,638,000 fr. for the work in prospect. They also decided to purchase more rolling stock, and a sum of 17,900,000 fr. is to be set aside for this purpose.

Doncaster.—Railless Cars.—The Corporation has received permission from the Ministry of Transport to equip route No. 6 (Station Road, West Laith Gate, West Street, and St. Sepulchre Gate) and route No. 7 (Old Hexthorpe) for railless cars, on condition that the Corporation hold themselves solely responsible for the working of route No. 6, prior to it being authorised. The Ministry has also approved the plan of the proposed turning circle of route No. 7 at the junction of Urban Road and Greenfield Lane.

Ecuador.—New Tramway.—An executive decree has been issued granting the Quito Municipal Council authority to construct and operate a tramway system uniting Quito with other towns in the Canton. The 30-year concession will be transferred to the National Tramway Company, to which the exclusive right to operate the line will be ceded.—*Reuter's Trade Service* (Quito).

Glasgow.—Tramcar Improvements.—The Corporation Tramway Committee has approved the manager's suggestion that the top decks of 300 double-deck cars be enclosed at an approximate cost of £19,500.

London.—M.E.T. Developments.—Important additions to the tramway facilities in North and West London may be expected shortly. A decision has been reached to construct three links between the existing tramway systems, which will make possible new through services. The areas that will especially benefit are Park Royal, the districts between Golders Green and New Southgate, and Walthamstow.

One of these new links will be provided between the Metropolitan Electric Tramways in Horn Lane, Acton, and the London United Tramways system in the Uxbridge Road, and the two companies will, as a result, be able jointly to provide a direct service from Willesden, starting, perhaps, at Cricklewood, through Park Royal and Acton to Ealing. Another new link in the Metropolitan Electric Tramways system is about to be carried out near Tally Ho Corner, North Finchley. The Middlesex County Council has agreed to lay tracks directly connecting the services in Ballards Lane and Hilton Avenue, so that a through route can be operated from New Southgate to Golders Green, Cricklewood and Paddington. The third scheme for linking up the tramway system involves the construction of about a mile of double track connecting the Metropolitan Electric Tramways in Tottenham with the Walthamstow Tramways, by way of Ferry Lane. The Middlesex County Council has decided to ask for authority to lay this track, over which services will be worked by the Metropolitan Electric Tramways, giving through tramway connections from Epping Forest and Walthamstow to the Bruce Grove neighbourhood and Finsbury Park and thence on to the City.

Majorca.—Railway Electrification.—Work is in hand on the electrification of the railway between Palma and Fort de Soller on the Island of Majorca a distance of 17½ miles. The trains will be operated at 1,200 V. d.c.

Siam.—Railway Electrification.—The Office National du Commerce Exterieur, reports that the Siamese State Railway authorities are considering the question of the electrification of the system.

York.—Tramcar Improvements.—The Corporation Tramway Committee has given instructions to the tramway manager to install upholstered leather seats in the tramcars as each car is brought into the workshop to be overhauled, the estimated cost being £40 per car.

Telegraph and Telephone Notes.

Australia.—Photo-telegraphy.—The Postal Department has accepted a tender for the introduction of a service of telegraph transmission of pictures between Melbourne and Sydney. It is expected that the service will be available for public use in April or May. The contract has been let to the British General Electric Co., Ltd. The patent rights of the transmitting plant are owned by a German company, Siemens & Halske. The British General Electric Co. acted as agent for the German company. Two other tenders were received, one from an American telephone company, and the other from a Melbourne firm, which has been formed to experiment with and exploit the transmission of pictures.

France.—Telephone Call Metering.—A new experiment is to be made in certain Paris telephone exchanges of keeping subscribers' accounts by photographs. After two subscribers have been connected, the new apparatus photographs an instrument which records the number of minutes occupied by the conversation.

Greece.—Wireless Telegraphy.—The directors of the Greek Postal and Telegraph Administration have completed the programme for the extension of the postal network for wireless telegraphy. For coastal services, particularly with ships, four wireless stations will be established at Attika, Sitia (Crete), Salonica, and on the island of Zante, respectively. The internal radio network is to be extended by the establishment of three stations, which are shortly to be thrown open to competition for supply and erection. As a result of these developments the whole of Greece will be comprised within the domain of State telegraphy.

Radio-telephony.—Beam Circuit Tests.—Developments in radio-telephony were predicted on the occasion of a recent demonstration by Marconi's Wireless Telegraph Co., Ltd. The tests are being conducted between the short-wave beam radio stations at Bridgwater (Somerset, England) and Montreal (Canada), and it is claimed that the circuit has carried simultaneous telephony and telegraphy successfully.

Transatlantic Telegraphy.—Tariff Reduction.—The Postmaster-General announces that reduced rates per word for night letter telegrams and week-end letter telegrams to Canada have been introduced on both the Imperial cable and beam wireless routes. This follows an announcement by the Western Union Telegraph Co. of reduced rates for night and week-end letter telegrams to North America, the company's third reduction since January 1st.

The Telephone Service.—York.—Converted to Strowger automatic operation in 1924, the main network at York now boasts a Strowger satellite exchange at Dringhouses, the new equipment having been successfully cut over on February 16th. It was manufactured and installed to the order of the British Post Office by the Automatic Telephone Manufacturing Company, Ltd. Dringhouses is some 1¼ miles to the south-west of York, and is the first outlying district to be separately equipped. The present equipment is for 200 lines, provision being made for ultimate expansion to 400. The system is 4-digit, with 4th-wire metering, discriminating selector repeaters being used, which absorb the first digit in the case of purely local calls.

New London Exchange.—The new exchange in the Norbury (London) area which was opened on the 27th of last month has a switchboard of the No. 10 type, with accommodation for 1,900 subscribers' lines, and was supplied by Siemens Bros. & Co., Ltd. It will serve the area until the new automatic director exchange to be called "Pollards" (which is to be installed in the same building) is completed.

Radio Notes.

Canadian Radio Commission.—Return to Canada.—The Canadian Royal Commission is returning to Canada this month to confer with the Provincial authorities. The Commission, which consists of Sir John Aird, as president, Mr. Charles Bowman, and Dr. August Frigon, spent a month in London in consultation with the B.B.C., and has visited the main Continental centres. The Commissioners are hopeful that, by the time a chain of powerful stations is built across Canada, it will be possible to arrange for a regular weekly programme of British broadcasting for Canadian listeners.

Continental Relays.—Extension.—Hungary will participate in future in the fortnightly exchange of programmes between the countries of Central Europe. International broadcasts have been given regularly by Germany, Austria, Czecho-Slovakia, and Poland since June 11th, 1928, when the first relay was made by Berlin to Vienna, Prague, and Warsaw.

Canada.—Station Changes.—The new list of radio stations issued by the Radio Branch, Department of Marine and Fisheries, at Ottawa shows two new stations. One is CJRX, 25.6 metres, 2 kW, short wave, which broadcasts simultaneously with another station owned by the same grain company at Fleming, Sask. (CJRW) on 296.9 metres. With the change of CKY, at Winnipeg, from 0.5 kW to 5 kW, CKX has been opened at Brandon, Man., with the old station that used to be CKY. The only other station broadcasting in the province is CNRW, which uses CKY, and has a Government-owned licence, that of the Canadian National Railways. There are now 78 broadcasting licences in the Dominion, not all of which are in use: sixteen are owned by firms, associations, and churches which have not their own broadcasting stations, but rent time from others in their cities. Station CFCF, at Montreal, now operates on a wavelength of 291.1 metres, 1,030 kilohertz. According to *World-Radio*, the Government is in receipt of more than a quarter of a million dollars as the contribution of listeners through the medium of the one dollar tax, which is applied to the improvement of the radio service.

Fultograph Picture Transmission.—Extension.—In view of improved processes in transmission, the B.B.C. has adjusted the times and stations allotted for picture transmissions outside programme hours as follows:—*Afternoon transmissions:* station 5XX from 2 to 2.25 p.m. on Tuesdays and Thursdays. *Night transmissions:* stations 2LO and 5XX from midnight to 12.15 a.m. on Mondays and Fridays; and station 5GB from 11.15 to 11.45 p.m. on Wednesdays and Saturdays.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Beckenham.—Electricity Department. L.p. feeder pillars. (March 8th.)

Blackpool.—March 27th. Town Council. Two electrically-driven sewage pumps. Specifications from F. Wood, borough engineer, Municipal Buildings, Town Hall Street.

Bolton.—March 18th. Board of Guardians. Electric lamps required during six months. Form of tender from H. I. Cooper, clerk to the Guardians, 28, Mawdsley Street, Bolton.

Bradford.—March 18th. Tramways Committee. Double-deck electric trolley vehicles. Form of tender from R. H. Wilkinson, general manager, 7, Hall Ings, Bradford.

March 18th. Dudley Hill Wesleyan Chapel. Wiring and fittings for chapel premises and classrooms, tenders with suggested lighting schemes to the Trustees, c/o The Caretaker, 11, Dudley Street, Bradford.

Bradfield.—March 18th. Rural District Council. Supply and installation of electric motors and switchgear, Pangbourne sewage works. C. H. Stafford, engineer, 209, King's Road, Reading.

Cardiff.—March 19th. Electricity Department. E.h.p. and l.p. cables, and one natural draught cooling tower. (March 1st.)

Chorley.—March 21st. Rural District Council. Two electrically-driven multi-stage centrifugal pumps, with switch and control gear, pipes, valves, &c. Specifications, &c. (deposit £2 2s.) from W. Cotterill, surveyor, High Street, Chorley.

Dartford.—March 21st. Electricity Department. 3,038 yd. e.h.p. cable. (See this issue.)

Earby.—March 20th. Urban District Council. Complete electricity distribution scheme. (March 8th.)

East Ham.—March 23rd. Electricity and Tramways Department. 5,750 yd. e.h.p. cable. (See this issue.)

Edinburgh.—March 18th. Electricity Supply Committee. H.p. sub-station switchgear. (March 8th.)

March 25th. Underground insulated cables, conduits, pave-

ment and road box frames and covers, house-service fuse boxes and fuseboards, electricity supply meters. (February 15th.)
March 15th. One 1,500-kW motor convertor. (February 22nd.) (We regret that by a printer's error this item was placed under "Earby" in our last issue.)

Exminster.—March 21st. Committee of the Devon Mental Hospital. Supply for six months of electric lamps, &c. Forms of tender from the clerk, Mr. Cecil Masters.

Farnworth.—March 25th. Electricity Department. L.p. cables. (See this issue.)

Gloucester.—March 25th. Electricity Department. Two 1,000-kW motor-generators. (March 8th.)

Harrogate.—March 23rd. Electricity Department. Cables, joint boxes, joint box compound, service meters, cut-outs and transformers for 12 months. (March 8th.)

Hull.—March 21st. Electricity Committee. Electrically-driven circulating water pump, motor, motor-starter, &c. (March 1st.)
March 21st. Electricity Committee. Three 1,500-kW motor-convertors. (March 8th.)

Ilford.—March 25th. Electricity Department. Supply of paper-insulated cables. (March 8th.)

India.—New Delhi.—Indian Stores Department. March 26th. Oil engine generator set. (B.X. 5157.)*

Knottingley.—March 25th. Urban District Council. Wiring 48 houses in Weeland Road, and Womersley Road. Forms of tender from the Council's Surveyor, Town Hall.

Lancaster.—March 18th. Electricity Department. Two water-tube boilers (36,000 lb. per hour), with mechanical stokers, economisers, air heaters, steel chimney and fans. (February 22nd.)

London.—Central Electricity Board.—April 15th. North-West England and North Wales Electricity Scheme, 1928. 33,000-V overhead transmission lines. (March 1st.)
April 29th. Central Scotland Electricity Scheme, 1927. Electricity meters. (See this issue.)
Metropolitan Asylums Board.—March 20th. Installation of automatic telephone system at the North-Western Fever Hospital, Lawn Road, Hampstead. (March 1st.)
Bethnal Green.—March 25th. Borough Council. Electric lighting installation at seven blocks of tenement buildings in Bethnal Green. (March 8th.)
Islington.—March 26th. Cleansing Committee. One new lead battery for Edison vehicle. (See this issue.)

Manchester.—March 18th. Central Purchase Committee. Incandescent electric lamps for 12 months. (March 8th.)
April 3rd. Electricity Committee. One 8,000-kVA air-cooled transformer. (See this issue.)

New Zealand.—Wellington.—April 15th. Post and Telegraph Department. Conductor cords. (B.X. 5098.)*

Pentre, Rhondda.—March 30th. U.D.C. Electricity Department. A.c. ordinary and prepayment meters, mains and house service material. (March 1st.)

South Africa.—Johannesburg.—March 21st. Town Council. 65,500 porcelain insulators. (B.X. 5114.)* Weatherproof wire. (B.X. 5113.)*
Port Elizabeth.—March 28th. Municipal Council. 33,000-V cable, transformers, disconnecting boxes, oil switches, link switches, trifurcating boxes, and electricity meters. (B.X. 5146-7-8.)*
Umtali.—April 18th. Municipal Council. 1,000-kW turbo-alternator, spray cooling plant, switchgear, transformers, crane, &c. (B.X. 5142-5.)*

Stourbridge.—March 21st. Board of Guardians. Electric lamps, shades, &c., for six months. G. F. James, clerk, 12, Hagley Road.

Turton (Nr. Bolton).—March 20th. Urban District Council. Cable, meters, joint boxes, ironclad fuses, &c. Form of tender from Electrical Superintendent, Council Offices, Bromley Cross.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—Brisbane.—City Council.
Turbo-alternator manufactured by the British Thomson-Houston Co., Ltd.; condenser, by Britons; and a condensate system by Mort's Dock (£67,427).—Australian General Electric Co., Ltd. (Accepted.)
Three boilers for the new power house at New Farm (£74,266).—Babcock & Wilcox, Ltd. (Recommended.)

Birkenhead.—Electricity Committee. Accepted:—
Cable (£1,434), W. T. Glover & Co., Ltd., and (£2,714), Hackbridge Cable Co., Ltd.

Bolton.—Watch Committee. Accepted:—
Experimental automatic traffic signals at Wheatsheaf Corner.—Forest City Electric Co., Ltd.

Bradford.—Electricity Committee.
C.i. sluice gates and frames for new cooling pond at Valley Road power station.—J. Blakeborough & Sons, Ltd.
Tramways Committee.
36 tramcar gear wheels, £216.—British Hele-Shaw Patent Clutch Co., Ltd.

Brentwood.—Mental Hospital. Internal wiring. The following tenders were received in connection with this scheme:—

Barrow & Co., Ltd.	£19,275
Ellis & Ward	13,827
W. E. Hutchinson	13,720
T. Clarke & Co., Ltd.	13,347
Malcolm & Allan (London), Ltd.	13,172
Tredegars, Ltd.	13,043
G. E. Taylor & Co., Ltd.	12,829
Electrical Installations, Ltd.	12,801
Rylands Electrical Co.	12,700
Gifkins & Co., Ltd.	12,601
Etna Lighting & Heating Co.	12,102
V. G. Middleton & Co., Ltd.	12,045
A. Higginbotham & Sons	11,699
Mann, Egerton & Co., Ltd.	11,152
Colston Electrical Co.	10,435
S. Dixon & Son, Ltd.	10,265
Power Contracts, Ltd. (Accepted.)	9,675
Read & Partners, Ltd.	9,240

Burton-on-Trent.—Electricity Committee. Accepted:—
Two 250-kVA transformers (£295).—Metropolitan-Vickers Electrical Co., Ltd.
Switchboard (£147).—Donovan & Co.

Canterbury.—City Council. Accepted:—
Steam and other pipes for the extension of plant at the electricity works, £910.—Babcock & Wilcox, Ltd.

Carlisle.—Electricity Committee. Accepted:—
One 15,000-kW turbo-alternator (£34,874).—British Thomson-Houston Co., Ltd.
One surface condenser (£10,052).—Mirrlees Watson Co., Ltd.

Colchester.—Town Council. Accepted:—
Plant for the extensions to the power station at Hythe:—
3,750-kW turbo-alternator, with Lea recorder equipment, &c. (£11,500).—W. H. Allen, Sons & Co., Ltd.
Marine boiler with accessories and soot blower (£10,390).—Babcock & Wilcox, Ltd.
500-kVA transformer (£242), switch cubicle (£137).—Crompton Parkinson, Ltd.

East Ham.—Electricity Committee. Recommended:—
2,200 yd. cables.—Enfield Cable Works, Ltd.

Egypt.—Egyptian State Railways.—The following tenders for the electrification of the Cairo-Heluan line were received:—

English Electric Co., Ltd.	£261,573
Brown, Boveri	261,706
Società Elec., Milano	274,993
Bergmann, Berlin	286,149
Siemens, Orient	287,974
Ganz	290,118
Groupe Français	302,836
Metropolitan-Vickers	307,551
A.E.G., Berlin	309,692
British Thomson-Houston Co., Ltd.	317,037
Skoda	319,648
Charleroi (A.C.E.C.)	369,995
Do. (alternative)	349,302
Soc. Nationale Serviliano	279,967
General Electric Co., Ltd.	353,225
Do. (alternative)	345,117
Elin, Vienna	308,235
Oerlikon	388,414

The shortest delivery period was that of the General Electric Co., Ltd. (11 months). The time quoted by the English Electric Co., Ltd., was 18 months, which was about the average.—*Reuter's Trade Service* (Cairo).

Erith.—Urban Council. Accepted:—
Installing electric light at the Sheridan Road site (£180).—Dickinson & Co.

Glasgow.—Improvements Committee. Accepted:—
Passenger lift at Glasgow Cross buildings.—A. & P. Steven, Ltd. (in lieu of the recommended tender of Waygood-Otis, Ltd.).
Baths Committee. Recommended:—
Electrical installation at Shettleston and Tollcross Baths (£971).—Haddow & Co., Ltd.

Hull.—Education Committee. Accepted:—
Installation of electric lighting at Francis Askew school extension (£1,000).—A. Shaw & Sons.
X-ray apparatus for East Hull clinic (£617); apparatus for light treatment and electrical therapy (£232).—Scholl and Son, Ltd.
Telephones Committee. Recommended:—
Table telephones and bell sets (£402).—Automatic Telephone Manufacturing Co., Ltd.
Bronze wire (£331).—F. Smith & Co.
Cable (£125), inside wire (£96).—W. F. Dennis & Co.
Electricity Committee. Accepted:—
E.h.p. pipe work (£8,605).—Aiton & Co., Ltd.

Leeds.—Electricity Committee. Accepted :—
Cables.—(£2,565), W. T. Henley's Telegraph Works Co., Ltd.; (£1,808), Enfield Cable Works, Ltd.; (£1,194), Hackbridge Cable Co., Ltd.; and (£1,059), Greenwich Cable Works, Ltd.
Water Committee. Accepted :—
Automatic control gear for electric pump (£64).—Metropolitan-Vickers Electrical Co., Ltd.

London.—CENTRAL ELECTRICITY BOARD. Accepted :—
South-East England Scheme.—66-kV and other cables in the London area : British Insulated Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; Pirelli-General Cable Works, Ltd.
66-kV switchgear.—British Thomson-Houston Co., Ltd.
Central England Scheme.—132-kV overhead transmission line : Balfour, Beatty & Co., Ltd.
132-kV outdoor switchgear.—General Electric Co., Ltd.
North-West England and North Wales Scheme.—132-kV overhead transmission lines.—Foundation Co., Ltd.
(The value of the contracts is approximately £3,250,000.)
SHOREDITCH.—Lighting Committee. Accepted :—
2,000-kW mercury arc rectifiers (£9,643).—Hewittic Electric Co., Ltd.
LONDON COUNTY COUNCIL.—Education Committee. Recommended :—
Electric lighting installation at Webber Street School, Southwark (£185).—H. J. Cash & Co.
WANDSWORTH.—Board of Guardians. Accepted :—
Engineering reconstruction at the Swaffield Road Institute, electric generating plant and motors (£2,604).—Ashworth & Parker.
Wiring for electric lighting and power (£1,816).—Anderson, Angell & Co.
ADMIRALTY.
Switches.—Edison Swan Electric Co., Ltd.

Manchester.—Housing Committee. Accepted :—
Electrical installations at houses on the Barlow Moor estate.—R. H. Clampnett & Co. and Hall & Stinton, Ltd.
Waterworks Committee. Accepted :—
Electrical operating gear at Lostock booster station.—J. Blakeborough & Sons.
Tramways Committee. Accepted :—
Special trackwork.—Titan Trackwork Co., Ltd.
Electricity Committee. Accepted :—
Repairs to battery, Dickinson Street.—Tudor Accumulator Co., Ltd.
Oil purifier, Stuart Street sub-station.—Metropolitan-Vickers Electrical Co., Ltd.
Static transformers.—C. A. Parsons & Co., Ltd., and English Electric Co., Ltd.
Education Committee. Accepted :—
Electrical installations : Beaver Road school, Crumpsall open air school.—John Adams, Ltd.

Oldham.—Education Committee. Accepted :—
Two rotary convertors for electricity laboratory, Technical College.—J. P. Hall & Co., Ltd.
Electricity Committee. Accepted :—
Cable.—Union Cable Co., Ltd.

Orsett.—Board of Guardians. Accepted :—
Installing electric light at the Institution (£762).—Grays Electrical Co.

Reading.—Board of Guardians. Accepted :—
Installing electric light at Battle Infirmary.—Erlco, Ltd. (£723).

Rotherham.—Electricity Committee. Accepted :—
Two truck type switches (£256).—A. Reyrolle & Co., Ltd.
Cable (£1,659).—Callender's Cable and Construction Co., Ltd.
De-aerating plant (£656).—Hick, Hargreaves & Co., Ltd.

Salford.—Tramways Committee. Recommended :—
200 tons of steel rails (£2,023).—Cargo Fleet Iron Co., Ltd.

Stirling.—Town Council. Accepted :—
Installing electric light at the slaughter house.—W. & T. Marshall.
Electrical work for the new Police Buildings.—A. Brewster.

Stretford.—Electricity Committee. Accepted :—
Twenty 6,600-volt cubicles (£17,627), transformers (£23,050), 33,000-volt switchgear (£28,600).—Metropolitan-Vickers Electrical Co., Ltd.

Wrexham.—Rural Council. Accepted :—
Wiring 150 houses for electric lighting (£1,011).—Mr. L. Pritchard.

Forthcoming Events.

British Electrical Development Association.—Friday, March 15th. Royal Society of Arts, John Street, Adelphi, W.C. 7.30 p.m. "Water Heating Development."

Royal Institution of Great Britain.—Saturdays, March 16th and 23rd. 21, Albemarle Street, W. 3 p.m. "Molecular Motions in Rarefied Gases." Sir Ernest Rutherford, P.R.S.

Friday, March 22nd. 9 p.m. "Penetrating Radiations." Sir Ernest Rutherford, P.R.S.

Institution of Electrical Engineers.—INFORMAL MEETING.—Monday, March 18th. Institution, London, W.C. 7 p.m. "Methods in Invention." Mr. C. Turnbull.

Thursday, March 21st. Institution, London, W.C. 6 p.m. "Direct Generation of Alternating Current at High Voltages." Sir Chas. A. Parsons, F.R.S., and Mr. J. Rosen. "Recent Developments in Turbo-Generators." Mr. J. A. Kuyser. (The papers will be preceded at 5.30 p.m. by a demonstration by Mr. R. T. Coe of a "Portable Electric Harmonic Analyser.")

(Mersey and North Wales (Liverpool) Centre).—Monday, March 18th. University, Liverpool. 7 p.m. "Radio Sets on the Mains." Mr. E. Y. Robinson.

(North-Western Centre).—Tuesday, March 19th. Engineers' Club, Manchester. 7 p.m. "Electrical Insulating Papers for the Manufacture of Power Cables." Messrs. T. N. Riley and T. R. Scott. "The Prevention of Ionisation in Impregnated Paper Dielectrics." Mr. S. G. Brown and Mr. P. A. Sporing.

(South Midland Centre).—Tuesday, March 19th. Joint meeting with the East Midland Sub-Centre. Town Hall, Loughborough. 6.45 p.m. Faraday Lecture. "How Electricity Does Things." Mr. Ll. B. Atkinson.

(South Midland Centre Students' Section).—Friday, March 15th. Grand Hotel, Birmingham. 7 p.m. Annual joint meeting with the Institutions of Civil and Mechanical Engineers. Graduates' and Students' Sections. Discussion on "A Hydro-Electric Power Station."

(Sheffield Sub-Centre).—Wednesday, March 20th. Mappin Hall, Sheffield. 7.30 p.m. "The Cause and Effect of Oscillation in Electrical and Mechanical Apparatus." Prof. W. Cramp.

(Tees-side Sub-Centre).—Wednesday, March 20th. Cleveland Technical Institute, Middlesbrough. 7 p.m. "Electric Supply in the Rural Districts of England." Mr. R. W. Gregory.

(London Students' Section).—Friday, March 15th. Institution, London, W.C. 6.15 p.m. "Wave-Form Analysis." Mr. C. F. J. Morgan.

Illuminating Engineering Society.—Tuesday, March 19th. Lighting Service Bureau, 15, Savoy Street, W.C. 6.30 p.m. "Architectural Lighting." Mr. W. Maitland.

Overhead Lines Association.—Wednesday, March 20th. Institution of Electrical Engineers, London, W.C. 5.30 p.m. "Notes on the Labours of the Ontario Hydro-Electric Commission." Mr. E. L. Stanton.

Institution of Civil Engineers (Midland Area).—Friday, March 22nd. Chamber of Commerce, Birmingham. 6 p.m. "Developments of the Generation and Distribution of Electrical Power in the British Isles." Mr. A. Page, chief engineer of the Central Electricity Board.

Physical Society.—Friday, March 22nd. Imperial College of Science, South Kensington, S.W. 5 p.m. Annual general meeting. Presidential address by Dr. W. H. Eccles, F.R.S.

Birmingham Electric Club.—Friday, March 22nd. Grand Hotel, Birmingham. 7 p.m. Annual dinner.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, March 23rd. South Wales Institute of Engineers, Cardiff. 6 p.m. "Power Factor." Mr. C. L. James.

(London Branch).—Saturday, March 23rd. Visit to Gas, Light and Coke Company's Works at Beckton.

(Western Sub-Branch).—Saturday, March 16th 60, Wind Street, Swansea. Informal discussion of the 1927 Report of H.M. Electrical Inspector of Mines.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following :—

20-20 vacuum cleaners.
EVANS projectors.
DAISY vacuum cleaners.
PENTICON cookers.
A device for indicating a map route by means of small lamps which are switched on in rotation.

Notes.

The British Association.

Dr. F. O. Bower, F.R.S., is to be nominated president of the British Association for the Advancement of Science for 1930, when the meeting is to be held in Bristol.

The Association has been invited by the City Corporation to hold its centenary meeting in 1931 in London, and the invitation has been accepted.

An invitation to members of the Association has been received from the French Association for the Advancement of Science to attend the latter's annual meeting at Havre in July. The B.A. has appointed a committee to make the necessary arrangements.

The Romance of Electricity.

In an interesting address by Mr. C. R. Spouge, at a recent luncheon of the Lincoln Rotary Club, Mr. Spouge said that the progress of electricity from the dawn of its inception to the final stage of application to the needs of modern life was one of the most interesting romances of civilisation. The Chinese and Greeks knew of the properties of the magnet and the electrical behaviour of amber under friction, but it was not until the middle of the 19th century that its potent forces were understood, harnessed, and transformed into the docile servant of man, which was only made possible by a new type of man with a new type of mind—a mind trained for scientific thinking. The simple fact that electricity had to be delivered by copper wires, instead of by carts or vans, had had a peculiar effect upon the whole trend of the electrical industry, and had made electrical development a more political problem than a scientific or engineering problem. To provide the infant industry with the "right" to lay its cables, legislation had to be invoked, and the complete history of electrical legislation made a particularly depressing story. In 1926 the most ambitious measure, the Electricity (Supply) Act, was sanctioned, and the only grave mistake in that Act was that it gave trading powers to municipal authorities.

Train Collision Report.

The report on the official inquiry into the circumstances of the accident which occurred on the Southern Railway, near London Bridge Station, on December 27th last, when a steam van train from New Cross Gate came into sidelong collision with an electric passenger train which was crossing the track of the van train, shows that the responsibility of the accident rests with the driver of the van train. He frankly admitted that he made a mistake in reading the signal of the up local line in error for the adjoining signal of his own up through line.

World Power (Sectional) Conference.

A sectional meeting of the World Power Conference on the complete utilisation of water-power resources will be held at Barcelona, Spain, between May 15th and 23rd, 1929, at the same time as the Barcelona Fair. It will be followed by official visits to places of interest in Spain from May 24th to June 4th, and it is being organised by the Spanish National Committee of the World Power Conference, with the official co-operation of the Spanish Government. The subjects dealt with are: (*a*) General hydrological problems; (*b*) technical problems of water-power utilisation; (*c*) economic and financial problems; (*d*) legal problems; (*e*) protective measures and defence works of undertakings. The fee for ordinary membership of the Conference is 30 pesetas, or one pound sterling, and copies of the technical programme (in English, Spanish, French and German) together with forms of application for membership may be obtained from the Secretary, International Executive Council, Central Office, World Power Conference, 63, Lincoln's Inn Fields, London, W.C.2.

The Whitefriars Lodge.

The Whitefriars Lodge, founded by members of the Kelvin and other Electrical Lodges, will be consecrated at Freemasons' Hall on April 19th. Those interested should apply for particulars to Mr. Arthur W. Cox, 4, Ludgate Hill, E.C.4.

A Large Lighting Fitting.

The massive central lighting electrolier installed in the Theatre Royal, Drury Lane, has so excited the admiration of a wealthy Chinese Towkay, of Kuala Lumpur, that he has ordered a replica of it for installation in his official residence in the Far East. The fitting is fashioned on classic Empire lines. The main band is 6 ft. in diameter, and around this there are eight 3-light arm clusters, supporting flambeau shades accommodating 60-W gasfilled "Osram" lamps, making a total spread of 8 feet to the centre of the lamps. The metal work is of cast-bronze, polished, and toned down to a dark colour, and it weighs over a ton. The bent glass panels and lower bowl are in satin finish, with clear cut relief. Sixteen inverted reflectors, each designed to house 500-W lamps, are also arranged inside the fitting, and these are supplemented by four 500-W and five 60-W lamps without reflectors. In addition, a number of other electric lighting fittings of an elaborate nature have been ordered, for which an initial contract exceeding £2,000 in value has been placed with the Kuala Lumpur Branch of the General Electric Co., Ltd.

Artificial Lightning.

Mr. F. W. Peck, a consultant, is reported to have described to a large gathering of electrical engineers in New York the recent artificial production in a laboratory of the General Electric Co., at Pittsfield, Mass., of a lightning flash 20 ft. long at a potential of 5,000,000 volts.

Royal Commission on Transport.

Following the meetings of the Royal Commission on Transport on January 31st and February 1st, at which evidence was given on behalf of municipal electric tramway authorities (Elec. Rev., February 15th, 1929), a meeting was held on February 15th at which Mr. C. J. Spencer, chairman of the Tramways and Light Railways Association, gave the views of his organisation. He said that restrictions under the Tramways Act prevented large profits from being made, and private tramway operation as a whole from being a remunerative business. Road maintenance had become a great burden since the advent of mechanical road vehicles. In the five years 1923 to 1927 privately owned tramway undertakings had spent over £2,000,000 on the repair and maintenance of permanent ways. Such indirect taxation was wrong in principle, and must ultimately be paid for by the passengers. The obvious remedy was to treat the tramway authorities in exactly the same way as the highway authorities. A tramway or light railway should be given the right to appeal against the granting of licences to outside parties, if it could be shown that it would injure the existing undertaking. Co-ordination with other and new forms of transport was desirable, and legislation was necessary in that connection.

Major H. E. Crawfurd, M.P., said that the tramway companies asked for protection, but what protection did they propose should be given to the public? He asked that question because, since the restrictions on omnibus services in London had been enforced, a great many fares had been increased.

Mr. Spencer said that he recognised that they could not have a monopoly unless they were controlled thoroughly.

At a further meeting of the Commission on March 8th, Col. R. E. B. Crompton, past president of the Institution of Electrical Engineers, gave evidence on behalf of the Electrical Vehicle Committee of Great Britain. He said, according to *The Times*, that the committee for which he stood represented many associations and individuals interested in the development of the electric vehicle. They included supply undertakings, manufacturers of electric vehicles and of electric accumulators, and the users of such vehicles. He contended that the only chance of doing away with horse-drawn vehicles, which were an impediment to the flow of modern street traffic, was to follow the example of Americans, who, by the extensive use of the electrically-propelled vehicle for the distribution of goods in their large cities, had practically abolished the horse. As the oldest chairman of electrical supply undertakings in Great Britain he was constantly asked by those who managed supply undertakings in America why they in England had done so little to encourage the use of the electric vehicle. Colonel Crompton said that the electric vehicle he had in mind would run up to 40 miles on a charge, although in certain cases it might be increased. He added that the average speed of the electric vehicle was probably about 15 m.p.h. Its acceleration was so great that it was the vehicle most easily controlled in traffic. It was therefore eminently suited for use in all towns where the traffic was heavy and congested. Electric vehicles had many other advantages. They were silent, gave off no fumes, and did not drop oil on the road surface. Other things being equal, electric vehicles represented the cheapest method by which the tradesman could deliver goods from door to door. So far as taxation was concerned, he held that the electric vehicle should be put on the same basis as horse transport. The public would obtain great advantage by the use of these cars in addition to the reduction of the cost of cleaning the streets and of damage to road surfaces. Many municipalities had already found this out, and their use for scavenging and municipal work was rapidly increasing.

The Ex-B.W.A. Association.

The eleventh annual reunion of the ex-British Westinghouse Association was held at the Hotel Cecil on March 8th, Mr. F. Massingberd Rogers presiding. Nearly 140 "old timers" turned up from all parts of the country. The chairman was inducted by the hon. treasurer, who preceded him to his place with the now famous "half crown" on the end of a long wand. Mr. B. P. Boyle gave the toast of "The Association," to which the chairman responded in reminiscent vein. The "Silent Toast" had a touch of sadness this year, as five members have died since the last reunion, Messrs. A. P. Ambler, J. A. Henderson, W. A. Hetherington, "Charlie" Parkes, and A. Simon. Letters of regret were received from all parts of the world, from members unable to attend; the toast "Absent Friends" was submitted with acclamation at 10 o'clock. The entertainment side of the evening was ably carried through by Mr. J. Gibson Young, himself a member of the Association, with Jacqueline and Imito. Among the usual informal toasts this year that of the "Grandfathers" provoked great merriment, the respondents being Messrs. Dyer, Seaman, Warrilow, and Sergt. McCully. The date of the next dinner will shortly be announced.

Finsbury College Dinner.

The Finsbury Technical College Old Students' Association held its annual dinner at the Trocadero Restaurant, London, on March 1st. A delightful spirit of cameraderie lent a special charm to the function. In a humorous speech Mr. R. W. Paul (past president) proposed "The Guests," and Mr. L. St. L. Pendred (vice president) replied in an equally witty strain. "The Association" was proposed by Prof. C. R. Darling, F.I.C., and replied to by the president, Mr. E. W. Moss. A musical programme of merit under the direction of Mr. Chas. B. Nadaud, completed the enjoyment of the company. Old students of this College who are not members of the Association are earnestly invited to get in touch with Mr. F. R. C. Rouse, the honorary secretary, at 15, Clifton Gardens, Golders Green, London, N.W.11.

Birmingham Electric Club.

The eighteenth annual dinner of the Birmingham Electric Club was held at the Grand Hotel, Birmingham, on March 8th. Mr. Frank Forrest (president) presided, and was supported by the Lord Mayor (Alderman W. Byng Kenrick), Mr. R. A. Chattock (city electrical engineer), Mr. S. T. Allen (Central England engineer, Central Electricity Board), Mr. D. G. Mackintosh (president of the Birmingham Association of Mechanical Engineers), Mr. S. H. Holden (chairman, the Midland Centre of the Institution of Electrical Engineers), Mr. H. Hooper (honorary secretary of the Midland Centre), Mr. J. M. Dunkley (honorary treasurer, Birmingham Electric Club), Mr. E. A. Reynolds (chairman of the local section of the National Electrical Contractors' Trading Association), Mr. D. G. Brooks (senior vice-president, Birmingham Electric Club), and Mr. J. F. E. Brake (director and sales manager, Standard Telephones and Cables, Ltd.

The LORD MAYOR of Birmingham, in toasting "The Club," said it was the oldest of its kind in the United Kingdom.

The CHAIRMAN, in responding, pointed out that Birmingham was rightly regarded as one of the leading centres of the electrical industry in this country. The Club was founded 25 years ago by a small band of enthusiasts who had great faith in the future of the industry at a time when, electrically speaking, they were only just emerging from the dark ages. At that time only four million kWh of electricity was sold in Birmingham per annum; to-day the Corporation electricity supply undertaking was selling 300 million kWh per annum. There was a real need for such a club as theirs, and at no time in Birmingham and district was it so necessary for electrical engineers to pull together as the present. The putting into effect of the 1926 Act, including the change of frequency of supply from 25 to 50 periods per second, would add enormously to the work and responsibility of many of their members, and was a task not to be lightly regarded, but the work could be lightened by that spirit of co-operation which the Club endeavoured to foster. The rate of progress in Birmingham in time would catch up some of the cities abroad, especially if the suburban railways of Birmingham were electrified, which was very much overdue. It had often been said that a low tariff was the best selling agent: be that as it might, the price question must be followed up by the work of the Electrical Development Association, with the co-operation of manufacturers' and contractors' associations. Large numbers of people in this country did not miss the economy of electricity because they had never enjoyed the use of it. Those were the people whom they had to reach, and in this connection he paid tribute to the splendid service which was being rendered by the many showrooms in the country. Last year they added nearly 11,000 new customers to their lists in Birmingham, and everything pointed to the fact that the electrical industry, which had been so favourably placed with regard to employment, was going to be much busier in the near future.

The toast of "Our Guests" was proposed by MR. D. G. BROOKS, and MR. F. J. E. BRAKE replied and extended an invitation to the members to visit his company's cable works at North Woolwich in May.

Faraday House Dance.

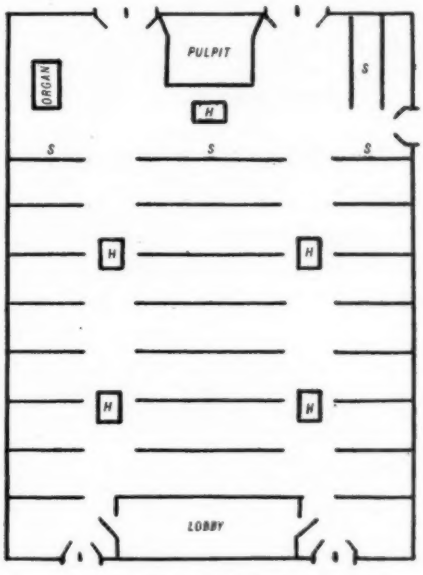
A successful carnival dance was held by the Faraday House Old Students' Association and its Rugby Club at the Victoria Halls, Southampton Row, on March 5th. As in previous years, this popular function was well attended, over 200 members and friends being present. The distribution of novelties added to the enjoyment of the evening and an exhibition of ballroom dancing by Mr. A. Milne and Miss N. Cave was a popular feature. Marius B. Winter's dance band provided the music. Among those present may be mentioned Messrs. F. E. Berry, R. C. Andersen, and F. G. G. A. Marraine, Major C. E. Prince, Major Flower, Dr. W. R. C. Coode-Adams, and the Rev. L. Van Vestraut (hon. secretary). Dr. A. Russell, F.R.S. who has been elected president of the Association this year in celebration of the 40th anniversay of the foundation of the College, was unable to be present through unavoidable circumstances.

Duty on "Imported" Electricity.

The Paris correspondent of the *Daily Telegraph* says that a curious case concerning invisible imports into France is occupying the attention of the correctional tribunal of Belfort. The Société Lorraine d'Electricité is being sued by the Customs authorities for having imported electricity without having made the necessary declarations. An expert who was charged to investigate the company's accounts reported that between January, 1925, and January, 1928, electricity of the value of 39,000,000 fr. (£312,000) was imported. The Nancy Court ruled against the Customs on the ground that electricity could not be considered as ordinary merchandise, and therefore could not be taxed, but the Court of Cassation took the opposite view. In arguments before the Belfort Court the Customs have entered a claim for double the value of the electricity imported without a declaration, that is, for nearly 80,000,000 fr. (£640,000). During a long debate their counsel declared that electricity was certainly merchandise, since it could be measured. The Court's decision has been reserved.

Small Chapel Heating Installation.

The accompanying illustrations depict how a space-difficulty problem in connection with the installation of electric heating in a small chapel in Gloucestershire was overcome, and it is

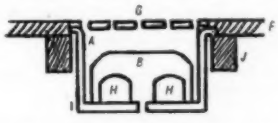


S, seats; H, heaters.

Disposition of Radiators in Chapel.

suggested that now that electricity is becoming available in rural districts there are probably many similar chapels which could be dealt with along the same lines.

The building in question is a small, nearly square, chapel, measuring about 35 ft. by 28 ft. by 20 ft. high. It is lined with a wood dado, and there is no space anywhere to fit radiators, as seats are against all the walls and the aisles are too narrow. It was decided that ten 1-kW electric radiators were necessary, and these are fitted in pairs in five positions below the floor. A hole has been cut in the flooring at each position in the gangways, and a sheet-iron box lined with cement-asbestos sheets sunk just below the level of the top of floor boards, a grating being placed over the box. The heaters are, of course, placed in the box. A square hole at the bottom of the box admits cold air *under* the heaters, and a baffle-plate of sheet-iron is placed *over* them. The



F, flooring; G, grating; I, iron box; H, heaters; A, asbestos lining; B, baffle plate; J, joists.

Section Through Radiator Chamber.

switching arrangements are such that the radiators are controlled in pairs, two of the pairs having each one radiator in each of a pair of boxes. The third pair is in the fifth and centrally-placed box. The installation is claimed to be giving entire satisfaction. The first of the above illustrations is a plan of the chapel, showing the disposition of the heaters, and the second represents a section through one of the radiator chambers.

Fatalities.

Private H. Brown, of the 2nd King's Shropshire Light Infantry, received a fatal electric shock on March 10th. He was cleaning a window at an officer's mess at Aldershot when he came into contact with a "live" wire.

An inquest was held at Manchester on March 6th, on the body of J. S. Hitch, 31, who received a fatal electric shock

of 6,500 V. Deceased was employed at the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd., and the works superintendent stated that he believed that Hitch dropped a spanner into the tunnel which protected the high-voltage cable, and after going below to retrieve it, put his foot on the h.p. bars when returning.

An Inquisitive Rat.

A rat which entered a sub-station of the Willesden Urban District Council on March 6th caused a short circuit which deprived the whole of the district of electricity for two hours.

Appointments Vacant.

Two boiler house charge engineers (£588) for the Municipality of Singapore Electricity Department. Plumber-jointer electrician for the Barnoldswick U.D.C. Meter reader and fixer for the Borough of Reigate Electricity Department. Electrician (70s.) for the Edmonton Board of Guardians. General manager for the Bagdad Tramways and Electric Lighting Syndicate, Ltd. (1,400 rupees per month). Assistant electrical engineer (£1,000 to £1,200) for the Perak Hydro-Electric Power Co., Ltd., Malaya. (See our advertisement pages to-day.)

Institution Note.

Institution of Electrical Engineers.

Informal Meeting.—At the informal meeting of the Institution on March 4th, Mr. J. R. Bedford in the chair, Mr. L. J. Hunt opened a discussion on "Variable Speed A.C. Motors." He dealt with the various methods of speed variation by grouping the motors under the three standard types, pole-change, cascade, and commutator, all depending upon the development of the additional counter-e.m.f., and Mr. Hunt's remarks were mainly directed to the application of each type to its particular problem. He said the Scherbius method was an excellent solution of the problem, but the number of machines involved serious complications and, except for some requirements, a better solution was a single Schrage motor; the latter was, however, very expensive, and he thought the all-round advantages were with the cascade method, which was simple and robust, while the speed could be changed by switching the connections on the slip rings without opening the stator circuit.

Mr. W. A. Erlebach plotted the e.m.f. and counter-e.m.f. on change of speed.

Mr. F. V. Schulthess described a new system of Scherbius regulation with a double rotor which seemed to be a development of the Spinner motor. It was a commutator motor with voltage regulation producing variable speed and power-factor correction.

Mr. J. H. Johnson said if the user could manage with a pole-change he would be well advised to do so. The commutator motor had limitations of size and was expensive in cost and upkeep. He thought the advantages were often with a motor-generator in spite of the space factor.

Mr. A. F. Harmer said the cost of variable-speed machines was large because the demand was so small. He believed the future would show a more extended use of single-phase than was generally anticipated.

Messrs. H. D. Barlow, J. R. Bedford, G. B. Bryan, B.A., D.Sc., B. M. Burt, A. N. D. Kerr, C. D. King, N. Prentice, E. S. Ritter, D. M. Robinson, L. E. Squire, E. O. Taylor, and W. L. Wreford also spoke.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

The report of the Engineering and Scientific Association of Ireland for the past year records the fact that Mr. Arthur E. Porte completed during the year 25 years' service as Honorary Secretary to the Association. The *Irish Electrician* reports that Mr. Porte's record as an engineer extends back another 25 years and more, for he was identified with the earliest work in Dublin, both in telephony and electricity supply.

The Birkenhead Corporation Electricity Committee has appointed Mr. G. W. Whitehouse, of Dudley, as motors and hiring superintendent.

Mr. Robert Roper, power station engineer with the South Wales Electrical Power Distribution Co. and chairman of the Electricity and Tramways Committee of the Pontypridd Urban District Council, has been appointed to the bench of magistrates for the county of Glamorgan.

Mr. J. N. Lindsay, boiler house charge engineer at the Hull electricity undertaking, has resigned to take up an appointment with the London Power Co., Ltd.

Owing to ill-health, Mr. Charles Erith has resigned his position of managing director of the Riley Stoker Co., Ltd., and has severed his connection with the company. Mr. J. O. Murgatroyd, the chairman, has taken over the management of the business.

The Oldham Corporation Tramways Committee has recommended increasing the salary of Mr. C. Jackson, the general manager, from £750 to £825 per annum.

The Derby Town Council has increased the salary of the borough electrical engineer, Mr. G. H. Lake, from £1,100 to £1,200 per annum.

The Croydon Town Council has adopted a recommendation to increase the salary of the borough electrical engineer, Mr. A. C. Cramb, from £1,500 to £1,600 per annum.

On March 25th, Mr. W. Bolton Shaw, M.Sc., M.I.E.E., consulting engineer, is removing from 25, Market Street, Manchester, where he has been in practice for the last 18 years, to 1, New Brown Street.

The Minister of Transport has appointed Sir John Brooke, C.B., to be an Electricity Commissioner. Sir John Brooke, who has been Secretary to the Central Electricity Board since its formation, is resigning that post and will take up his new duties at once. Consequent on the resignation of the above position by Sir John Brooke, C.B., the Central Electricity Board has appointed Mr. Richard Hodding Fox, its present solicitor, to be secretary and solicitor to the Board. Sir John Brooke was formerly Secretary to the Ministry of Transport, a post which he occupied when the Ministry introduced into Parliament the Bill which ultimately became the Electricity (Supply) Act, 1926. This Act provided for the creation of the Central Electricity Board, and since the inception of the Board, Sir John Brooke has held the position of Secretary to the Board. Mr. Fox was for many years a partner in the firm of Messrs. Torr Durnford & Co., Parliamentary agents, and Messrs. Torr & Co., solicitors, London, and retired from private practice to become solicitor to the Board when it was set up early in 1927.

Elliott & Fry [*London.*

Sir John Brooke, C.B.,

The New Electricity Commissioner.

Mr. H. W. BOSWORTH, who has for the past 24 years been connected with the Lancashire Dynamo and Motor Co., Ltd., and for the last 12 years as director in charge of its London business, has been appointed joint managing director of the company, and is moving to Trafford Park, but he will be frequently visiting London.

Mr. A. C. FENWICK, engineer and general assistant to the tramway manager of Dundee, has been appointed general manager of the Bury Corporation tramways.

The Holmfirth Urban Council has confirmed the appointment of Mr. H. G. SPENCE, Ravensthorpe, Dewsbury, as electrical engineer, at a salary of £350 per annum.

Obituary.—SIR J. D. DENISON-PENDER.—We regret to record the death, which occurred on March 6th, at his residence in Grosvenor Crescent, S.W., of Sir John Denison Denison-Pender, third son of Sir John Pender, whose pioneering connection with trans-Atlantic submarine telegraphy made him famous. Sir John Denison-Pender was born in 1855, and was therefore 73 years of age. He commenced his definite relations with the Eastern group of cable companies, with which his father was so closely associated, in the year 1878. Three years later he became a director of the Eastern Company, and in 1898 a managing director. The honour of knighthood was conferred upon him by King Edward in recognition of his submarine cable service rendered during the South African war. When his father, Sir John, died in 1896, he became deputy chairman, and in 1917 chairman. His eldest son, Mr. J. Cuthbert Denison-Pender, was then appointed managing director, and he holds that office, as well as the vice-chairmanship, to-day. The great story of what was done by the great cable interests and their personnel in defeating our enemies in the Great War has never been written in detail, and probably never will be, but among those who placed themselves and their great organisations at the service of the Allies none played a worthier part than the late Sir John and his companies. Their contribution in the form of actual and wonderful achievements is known within submarine cable circles, and the honour of G.B.E. was conferred upon him in 1920. Two years later the Jubilee of the Eastern group took place in London, and one of the most interesting functions consisted of the presentation of a testimonial bearing the names of 8,000 members of the staffs in this and many other countries. *The Times*, in its appreciation of Sir John's distinguished service, mentions that in the recent negotiations for the merging of cables and wireless he played an important part, "and he lived long enough to be assured of the success of his diplomacy."

The funeral took place at Slaugham, Sussex, on Saturday. Those present included a large number of gentlemen of distinction from the boards and staffs of the companies over whose destinies Sir John exercised so large an influence, also prominent representatives of other cable, telegraph construction and wireless companies, and their staffs. At 12.15 p.m., Greenwich time, all circuits throughout the entire system of the Eastern Associated Companies observed a one-minute stoppage so that every member of the staff who was on duty could stand in silence as a tribute to their "head" at the time of the committal of the body to the grave in the village churchyard where Lady Pender was buried some years ago.

MR. C. H. COPE.—The death has taken place, at the age of 84 years, of Mr. Clarence Hughes Cope, who was for over 35 years on the staff of Fraser & Chalmers, of Erith. Prior to joining that firm he spent many years in business on the Continent. He was an accomplished linguist.

MR. C. WOOD.—The death took place on March 6th, at his residence at Southborough, of Mr. Charles Wood. He was 83 years of age, and some 50 years ago he took charge of the first electric lighting plant at the emporium of Messrs. Charles Baker, of High Holborn, London. Subsequently he transferred his services to the installation at Broomhill, Tunbridge Wells, becoming engineer to the late Sir David Salomons, Bart. He held this position for 44 years.

MR. T. B. CALLARD.—The death has taken place, at his residence at Chesham Bois, at the age of 82 years, of Mr. Thomas Black Callard, who was a director of James Keith and Blackman Co., Ltd., heating and lighting engineers.

DR. M. BRESLAUER.—The death recently occurred in Berlin of Prof. Dr. Max Breslauer, of the Technical High School of Berlin. According to the *E.T.Z.*, about 1906 the deceased was for a time chief engineer of the Electric Plant Co., Ltd., of Alloa, Scotland.

Mr. F. STEVEN.—The death occurred on March 2nd of Mr. Fred Steven, electrical engineer, of St. Mary Street, Dumfries, where he commenced in business about five years ago.

Mr. T. F. MERSELES.—A *Financial Times* dispatch reports the sudden death of Mr. T. F. Merseles, president of the Johns Manville Corporation, whilst travelling to California.

Mr. F. J. SANTONNA.—The death is announced at the age of 85 years of Mr. J. F. Santonna, of Sidbury, Worcester, who had attained the age of 85 years. He was in business in the city for nearly half a century, was a pioneer in electrical matters, and established an extensive business as an electrician. He installed electricity in the Shire Hall, The Guildhall, The Cathedral, and in numerous local factories and business premises.

MR. T. HARTLEY.—The death took place on March 2nd, at the age of 65 years, of Mr. T. Hartley, traffic superintendent of the Huddersfield Corporation Tramways, a position which he had held since 1902, when the system was electrified.

Will.—The late Mr. JOSEPH F. CARLISLE, formerly of the submarine cable service of the Eastern Telegraph Co., Ltd., left £5,680 gross and £4,436 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Autocar Electrical Co., Ltd.—Private company. Registered March 5th. Capital, £2,500 in £1 shares. Objects: To carry on the business of electricians, electric platers and battery chargers, and that of a general motor car, electrical and wireless service, &c. The directors are: A. R. Jones, 27, St. Michael's Square, Gloucester; N. G. Rabasch, 1, Station Road, Gloucester. The said A. R. Jones shall be permanent as long as he holds 250 shares. Secretary: A. R. Jones. Solicitor: H. H. Vowles, 65, Northgate Street, Gloucester.

Pandona, Ltd.—Private company. Registered March 7th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless receivers and instruments, electric or other advertising signs, refrigerators, vacuum cleaners, optical instruments, furniture, motor cars, &c. The directors are: W. F. Hutton, 33, Sandon Road, Edgbaston, Birmingham; F. Johns, Middleton Hall Road, Kings Norton, Birmingham. Qualification: 5 shares. Registered office: Empire House, 159, Great Charles Street, Birmingham.

Frank Wall & Co., Ltd.—Private company. Registered March 8th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electricians, mechanical and electrical engineers, contractors, plumbers, suppliers of electricity, &c. The directors are:—F. Wall, 1, Hardy Street, Oldham, electrical engineer; J. H. Newton, 179, Grange Avenue, Oldham, electrical engineer. Registered office: 25, Union Street, Oldham.

Langham Radio, Ltd.—Private company. Registered March 2nd. Capital, £100 in 1s. shares. Objects: To carry on the business of manufacturers, assemblers, and constructors of all kinds of wireless and electrical instruments, machines and apparatus, cabinets, gramophones, &c. The subscribers (each with 20 shares) are: Winifred Roberts, Abbotswood, Crescent Road, Highgate, secretary; Alice E. Reynolds, Weycroft, Wey Lane, Chesham, Bucks., solicitor's clerk. The first directors are to be appointed by the subscribers. Registered office: Fitzalan House, Arundel Street, Strand, W.C.2.

South-East Yorkshire Light & Power Co., Ltd.—Registered as a public company, March 1st. Capital, £50,000 in £1 shares. Objects: To carry on the business of an electric light, heat and power supply company, and that of electrical, metallurgical, mechanical, and chemical engineers, electricians, and contractors, suppliers of electricity and electrical energy, manufacturers of electrical apparatus, &c. The first directors are: D. A. Evans, "Chelston," Gunnersbury Lane, W.3, consulting engineer; E. J. Guinness, 15, Basil Mansions, Basil Street, S.W.3 (director, the General Consolidated Investment Trust,

Ltd.); F. Heppenstall, 226, Stanley Park Road, Carshalton, engineer; H. L. Howard, 27, Glenesk Road, Parkside, Eltham, S.E.9, engineer. Registered office: 53, Cornhill, E.C.

Sun-Ray Electric Lamp Co., Ltd.—Private company. Registered March 4th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric lamps, fuses and signs, agents for and dealers in all kinds of electrical and wireless apparatus, &c. The subscribers (each with 100 shares) are: A. E. Morter, T. Morter, and Mrs. M. Morter, all of The Nook, Wash Lane, Clacton-on-Sea. Secretary: T. Morter. Registered office: Wash Lane, Clacton-on-Sea.

Accumulator Co. of Scotland, Ltd.—Private company. Registered in Edinburgh on March 2nd. Capital, £100 in 5s. shares. Objects: To carry on the business of manufacturers and repairers of batteries and magnetos, &c. The subscribers (each with one share) are: R. G. Gammon, 100, York Drive, Hyndland, Glasgow, electrical engineer; J. S. Donaldson, 12, Greenlaw Avenue, Paisley, writer. R. G. Gammon is the first director. Registered office: 101, West Nile Street, Glasgow, C.1.

British Electrical Grid Co., Ltd.—Private company. Registered March 1st. Capital, £300 in £1 shares. Objects: To carry on the business of electricians, electrical, mechanical, and general engineers, &c. The directors are: M. A. Cohen, 13, Claremont Terrace, Sunderland; S. Cohen, 45-46, West Sunniside, Sunderland. Registered office: 45-46, West Sunniside, Sunderland.

Zirko, Ltd.—Private company. Registered March 2nd. Capital, £1,500 in £1 shares. Objects: To carry on the business of experimenters with, workers in, manufacturers of, and agents for vulcanite, ebonite, rubber, rubber substitutes, compositions, and insulating materials of all kinds, &c. The permanent directors are: A. W. Wright, "Melverne," Gorden Lane, Moor Park, Fazackerley; Mrs. Clarence M. Woodthorpe, 1, Chapel Avenue, Aintree; W. S. Roberts, "Newby," Ruff Lane, Ormskirk.

Eros (Dundee), Ltd.—Private company. Registered in Edinburgh on March 2nd. Capital, £2,000 in £1 shares. Objects: To carry on the business of electricians, electrical, mechanical, motor and radio engineers, contractors, manufacturers, &c. The directors are: A. J. Brinkler, "Hullavington," Beaumont Road, Orpington, Kent, merchant; W. Yuill, 17, Forthell Drive, Broughty Ferry, radio engineer. Secretary: Elizabeth R. Dargie. Registered office: 27, Crichton Street, Dundee.

Official Returns of Electrical Companies.

Montevideo Telephone Co., Ltd.—Capital, £220,000 in £1 shares. Return dated January 4th, 1929. 217,135 shares taken up. £217,135 considered as paid. Mortgages and charges, nil.

Allerton Electrical Supplies, Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st, 1928. 1,500 shares taken up. £1,500 paid. Mortgages and charges: £1,400.

Nalder Bros. & Thompson, Ltd.—Capital, £30,000 in 15,000 preference and 15,000 ordinary shares of £1 each. Return dated December 12th, 1928. 12,000 preference and 11,881 ordinary shares taken up. £13,881 paid, £10,000 considered as paid. Mortgages and charges, nil. Return of allotments made up to December 19th, 1928, shows a further 2,968 preference and 2,968 ordinary shares allotted, payable in cash, and fully called up.

Cymbal, Ltd.—Capital, £200 in 2s. shares. Return dated January 12th, 1929. All shares taken up. £200 paid. Mortgages and charges, nil.

William J. Hook & Co., Ltd.—Capital, £1,000 in 500 preference and 500 ordinary shares of £1 each. Return dated December 17th, 1928. 400 preference and three ordinary shares taken up. £403 paid. Mortgages and charges, nil.

Horley & District Electricity Supply Co., Ltd.—Satisfaction in full on September 28th, 1928, of charge dated April 1st, 1927, securing £1,500. (Notice filed February 27th, 1929.)

Harrison & Searle, Ltd.—Debenture dated February 20th, 1929, to secure £1,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: W. Tregellas, 955, Pershore Road, Selly Park, Birmingham.

Electrical Appliances (Blackpool), Ltd.—W. B. Haworth, 35, Cookson Street, Blackpool, was appointed receiver and manager on February 19th, 1929, under powers contained in debenture dated April 10th, 1928.

Cleveland and Durham Electric Power, Ltd.—Satisfaction to the extent of £13,400 on various dates between March 29th, 1928, and January 7th, 1929, of debentures secured by trust deed dated October 6th, 1913, and supplemental trust deed dated December 31st, 1918, securing £250,000.

Automatic Telephone Manufacturing Co., Ltd.—Satisfaction in full on January 1st, 1929, of first mortgage bonds secured by trust deed dated January 17th, 1921, securing £350,000.

City Notes.

General Electric Co., Ltd.

Last week the board issued the following statement with regard to the proposed creation of 1,600,000 new "British" ordinary shares (*vide* our last issue, p. 439):—"In view of misapprehensions which have apparently arisen with reference to the proposed increase of capital, the directors wish to make it clear that there is no intention of making an issue limited to existing shareholders only. They have now completed arrangements under which, subject to the sanction of the general meeting of the resolutions which have been submitted to their shareholders, an issue will be made to the British public generally."

The formation of a Committee to protect the interests of American shareholders was announced from New York last week, and at the week-end the board of the company received the following cablegram from the committee:—

"As a committee of holders of a substantial number of shares of your company, represented by the certificates issued by the Guaranty Trust Company of New York, we hereby protest against the proposed action to be taken at the extraordinary meeting of your corporation to be held on March 13th. We understand approximately forty per cent. of the outstanding stock of your company is represented by certificates issued by the Guaranty Trust Company. The proposed action, if consummated, will deprive the foreign holders of these certificates of a substantial property interest. The committee is cognisant that the corporation has limited the voting rights to British holders, but strongly objects to the announced plan, which substantially affects the property rights of foreign stockholders and, we believe, is opposed to British principles of equity. We understand that one of the purposes of the proposed action is to provide funds to retire the outstanding debentures of your company. On behalf of the American stockholders we respectfully request that the proposed action be modified so that the ordinary shares of the corporation be increased by one million six hundred thousand and that the additional shares be offered *pro rata* to all stockholders. This action will achieve the desired purpose, will recognise the rights of stockholders, and in view of the restriction of the voting power will preserve to English citizens the actual operation and control of the company. We propose to supplement this protest by appearing at the meeting through a representative. May we not suggest that should the action proposed by your company be consummated it will not only react most unfavourably on American sentiment with respect to your shares, but also as to other English shares traded in by the American public. The committee consists of Thomas L. Chadbourne, H. W. Croft, H. B. Baruch, Latham R. Reed, D. C. Dilworth. Chadbourne Stanchfield and Levy, counsel."

Sir Hugo Hirst, chairman and managing director of the company, sent the following reply:—

"We acknowledge receipt of your courteous telegram protesting against the proposals which are to be submitted to an extraordinary meeting of this company on Wednesday next. We believe your protest is due to a misunderstanding of our proposal. We understand you agree that our intention to redeem the debentures is sound, as when redeemed £60,000 additionally will be available for the benefit of ordinary shareholders, regardless of their nationality, calculated on last year's earning capacity and declared dividends. As regards confining the issue to the British public, we are sorry that you consider this an unfriendly action. We have the warmest regard for America and have no wish to disturb the traditional good relations between the two countries or between this company and its many good friends on your side. Trading as we do in most countries of the world, we have no narrow-minded conception. During recent months our shares have enjoyed such popularity in your country that at present approximately you hold 60 per cent. This may not matter if considered from the purely financial aspect, but it would have a seriously damaging effect from the trading point of view. As managing director of this company since its inception, I have had the experience that one of the pillars on which our success has been built has been the well-spread holding of our ordinary shares among the British public. This issue is intended to secure to us in continuity a certain percentage of British shareholders who are interested in the use of our products and the developments of our company at home. The benefits of that policy will come equally to all the proprietors, whatever their nationality. We trust this explanation removes from your mind any idea of intended unfairness against our American friends. As regards this issue price of £2 2s., you seem to consider this price as if it constituted a bonus issue. This is an error, as we have fixed this price after consultation with prominent British issuing houses, and are advised that this is a fair price compatible with the yield on industrial shares in this country of similar class and prospects. Any benefits such as possible increased dividends

or capital bonuses will always belong to all proprietors without distinction. It is not proposed to offer rights to any section of existing shareholders on the register to subscribe for new capital and, subject to the resolution increasing capital being passed at the forthcoming meeting, 1,500,000 new shares have already been sold to London issuing house, imposing the obligation on them to distribute shares in the widest possible manner. In conclusion, the board has for some time viewed with grave alarm the diminution in the number of British shareholders on the register, and is convinced that its action is in the best interest of the proprietors and conducive to the earning of maximum profits. With much regret, if our proposed action should unnecessarily hurt feelings on your side, but the board must remain ultimate arbiter in guiding the company's affairs."

At the extraordinary meeting on Wednesday last the resolutions put forward were approved, with only two or three dissentients, after a lengthy discussion. Sir Hugo Hirst's speech and notes on the proceedings will appear in our next issue.

Midland Counties Electric Supply Co., Ltd.

The annual meeting was held on March 4th, when Mr. George Balfour (chairman), who presided, said that the electrical energy sold was 133,596,000 kWh, an increase of more than 29,000,000 kWh over the preceding year. The increase for the past two years amounted to approximately 60,000,000 kWh, which was almost exactly the total output from the company's power stations in 1925. The number of consumers connected had increased by 5,385 to 20,577, and the connected load by 19,676 kW to 105,300 kW. The maximum load recorded reached 42,910 kW, in addition to 2,000 kW purchased from other sources. The length of e.h.p. lines completed during the year was 105 miles, and of l.p. lines, 109 miles, making a total route length of h.p. and l.p. lines of 1,091 miles. The company was now supplying in three boroughs, 26 urban districts, and 134 parishes, and was giving bulk supplies to 10 local authorities and company undertakings. Four Special Orders were obtained for East Nottinghamshire, Mid-Warwickshire, Market Bosworth and district, and Fleckney Kibworth and district. At Spondon a 25,000-kW set was in course of erection, and four boilers had been brought into operation. Owing to the increased demand it was necessary to provide additional boiler plant at both stations. Referring to the Central England Electricity Scheme, Mr. Balfour said that all the company's generating stations had been classified as selected stations under the scheme. The traction business was still passing through a bad time, but by an Act of Parliament last year it was now possible to deal in a more elastic manner with this problem. Since the passing of this Act, there had been a considerable improvement in consequence of the reasonable degree of security which had been obtained. The report and accounts were adopted.

Metropolitan Electric Supply Co., Ltd.

The annual meeting was held on March 6th. Mr. G. Balfour (chairman), who presided, said that the introduction of a two part tariff had resulted in an average increase of 20 per cent. in consumption by consumers who had adopted this tariff. An additional bulk supply agreement had been entered into during the year with the Heston and Isleworth Urban District Council, and a Special Order extending the area of the Chesham Co., was sanctioned in August last. Transmission lines in the new area were being laid, and it was expected that a supply in Missenden and Goddesden would be available at an early date. The length of h.p. and l.p. cables laid now totalled 621 miles. The western area 22,000-V transmission system had been augmented by a new feeder between Willesden and Southfield Road, and additional sub-stations at Taplow and Beaconsfield were put into commission during the year. The output of electricity was 126 million kWh, as compared with 106¼ millions for the preceding year, an increase of over 18 per cent. The total load connected was 151,569 kW, an increase of 20,106 kW, and the maximum demand reached 61,000 kW. During the year, apart from consumers connected by subsidiary companies, the company had connected 2,531 additional consumers, making the total 34,458. In addition, 3,049 consumers were connected to the mains of the subsidiary companies, making the total served by these companies 15,550, and the total number of consumers served by all the undertakings 50,008. The report and accounts were adopted.

Underground Electric Railways Co. of London, Ltd.

In the course of his speech at the annual meeting on March 7th, Lord Ashfield (chairman) said that the question of a combined meeting of all the companies of the group was being studied. The tramway undertakings had shown a definite improvement during the past year. Further increase in traffic could be anticipated now that measures had been taken to regulate the competitive services. They did not fear any slackening in the growth of London traffic, but when the question of expenses was considered the situation was not so certain. Wages represented 61 per cent. of the total operating costs. Although the cost of living index showed a fall during the past five years, they had increased wages. Their staff was in receipt of better wages than those paid by any other transport undertaking; if £3 a week was taken as a minimum standard, only 1,400 adults out of a total of 40,000 employed fell below that standard. The result had been contented and willing service and friendly relations. Referring to the rise in the price of petrol and to the heavy burden of rates and taxes, Lord Ashfield said that they could not both pay taxes and find money for the new tubes which had become necessary. In dealing with the subject of co-ordination of London traffic, the speaker pointed out that this was only following the examples of Paris and Berlin; the same matter was also being studied in New York and Chicago. After reviewing the accounts (Elec. Rev., March 8th, p. 439), Lord Ashfield said, in conclusion, that although the earnings so far this year had shown a decline on account of the severe weather, he was not inclined to take a pessimistic view of the future.

Electrical Distribution of Yorkshire, Ltd.

Presiding at the annual meeting on March 5th, the chairman (Mr. R. W. Wickham) said that there had been a large increase in the number of consumers and 15,248 new connections had been made in the last two years. The system of hire and hire-purchase of electrical apparatus which had been introduced was responsible for a distinct increase in the use of electricity for domestic purposes. During the year further agreements had been made for street lighting and 44 local authorities were now taking electricity for this purpose. Further agreements were already in negotiation. Application had been made for powers to supply in part of the rural district of Worksop. The Order had been made by the Electricity Commissioners and when confirmed by Parliament the company's area of supply would be increased to 1,197 sq. miles with a population of 744,000. Referring to the Central Electricity Board's schemes, Mr. Wickham said that there was a tendency to assume that the costs of generation which had been quoted in the Press were the prices at which electricity could be sold to the consumer. Generation was not all: the costs of distribution also had to be met, and when electricity was supplied in small quantities to users spread over a thinly-populated area it could not be expected that great reductions for small users would result from decreases in generation costs. The actual reduction of generation costs which the Commissioners estimated would be made in the first five years was only 1/20d. per kWh.

Stock Exchange Notices.

Application has been made to the Committee to allow the following to be officially quoted:—

West Gloucestershire Power Company.—£50,000 five and a-half per cent. first mortgage sinking fund debenture stock.

Yorkshire Electric Power Company.—897,000 ordinary shares of £1 each, fully paid, Nos. 1,603,001 to 2,500,000; and 20,000 six per cent. cumulative preference shares of £1 each, fully paid, Nos. 1,603,001 to 1,623,000.

Adelaide Electric Supply Company.—250,000 6½ per cent. "C" cumulative preference shares of £1 each, fully paid, Nos. 750,001 to 1,000,000.

Dealings in the following have been allowed by the Committee under Rule 159:—

Sphinx Electric.—290,000 10 per cent. participating preference shares of 5s. each, partly-paid and fully-paid, Nos. 1 to 290,000. 10,000 10 per cent. participating preference shares of 5s. each, fully-paid, Nos. 290,001 to 300,000. 580,000 ordinary shares of 1s. each, fully-paid, Nos. 1 to 580,000. 770,000 ordinary shares of 1s. each, fully-paid, Nos. 580,001 to 1,350,000.

Underground Electric Railways Company of London.—9,523 new ordinary shares of £1 each, fully-paid, Nos. 7,064,654 to 7,074,176. (Ranking for dividend from January 1st, 1929.)

Chiswick Electricity Supply Corporation, Ltd.

Mr. H. Kahn (chairman) presided at the annual meeting on March 5th, and in presenting the report and accounts (*vide* our issue of March 1st, p. 392) said that further advance had been made, and there was every prospect of continued expansion during the current year. He warned the shareholders, however, that the rates both at Chiswick and Aberystwyth would be considerably heavier as their assessments had been practically doubled. At Chiswick, on the new assessment, the rates would work out at ¾d. per kWh. The balance sheet showed a very strong financial position. Although a sub-committee of the Chiswick District Council had recommended the Council to exercise the option of purchase which arose this year, the Council decided not to do so; the next opportunity would not occur until 1934. The company, in conjunction with other interested undertakings, had obtained an injunction against the London and Home Counties Joint Electricity Authority restraining it from proceeding with a Bill enabling it to acquire the purchase rights of local authorities in its area, and the Bill had now been withdrawn. The report and accounts were adopted.

Scottish Power Co., Ltd.

The trading profit for the year ended December 31st last of the undertakings owned and operated by this company, rose from £99,449 to £116,689. Of this £22,522 has been reserved in the companies' accounts and the balance has been paid over to the Power Co. After meeting expenses and adding £3,253 brought forward, there is an available balance of £85,840 (against £56,395). Debenture interest, &c., and preference dividend are paid, £4,446 is transferred to reserve

(against £5,745), and it is proposed to pay a dividend at the rate of 8 per cent. per annum upon the old ordinary shares and instalments of new ordinary shares, of which 600,000 were issued during the year; a balance of £3,399 is carried forward. The proceeds of the issue mentioned are being utilised to redeem outstanding debenture stock, for extensions to plant and mains, and for expenditure on the development of the Grampian hydro-electric undertaking. The meeting was to be held on Wednesday this week.

Enfield Cable Works, Ltd.

The accounts for the eighteen months ended December 31st, 1928, show a profit of £162,317, as compared with £102,718 for the twelve months ended June 30th, 1927. After adding £26,083 brought forward and deducting directors' fees and depreciation there is an available balance of £169,150. The preference dividends are paid and a 10 per cent. final dividend is declared on the ordinary shares, making 30 per cent. for the period, as compared with 20 per cent. for the preceding year (the same rate). The reserve receives £40,000 again, making it £140,000, and a balance of £31,650 remains to be carried forward. The directors have decided to acquire interests in certain allied businesses and for this purpose propose to raise the capital to £800,000 by the creation of 350,000 ordinary shares of £1 each. If this is approved it is proposed to issue 100,000 shares immediately, offering them to the existing shareholders at £2 each in the proportion of two new shares to each five already held. Meeting: March 20th.

City of London Electric Lighting Co., Ltd.

The report for 1928 states that the directors are now able to deal with the unallocated balances. The Electricity Commissioners have fixed the standard prices, which will apply from January 1st, 1926, to December 31st, 1932, as follows:—For street lighting, after deducting expenditure specially relating thereto, 0.794d. per kWh; for supplies to private consumers, 3.069d. per kWh. The "consumers' benefit" figures for the past three years are set out as well as particulars of sums apportioned to the company's co-partnership scheme. The balance of net revenue for the past year is £253,341. After meeting the standard dividends (10 per cent. in the case of the ordinary shares), placing to reserve one-sixth of consumers' benefit (£45,990), and appropriating £31,695 for co-partners' benefit, a balance of £7,657 is carried forward. The price reductions made during the past three years are said to represent a relief to the consumers of £582,306, and during that period the consumption has risen by 37 per cent. Meeting: March 20th.

Ross-shire Electric Supply Co., Ltd.

At a meeting on March 15th, the company agreed to extend to the Grampian Electricity Company control of the management of the company in all matters apart from any proposal to liquidate. The promoters of the Grampian scheme become responsible for the present financial requirements of the company up to £20,000, on condition that the 7½ per cent. cumulative preference shares become non-cumulative preference shares with interest at 5 per cent., but participating with the ordinary shares up to 7 per cent. and that 9,000 deferred shares be transferred to the lenders by their present holders—who had agreed—and take rank with the ordinary shares, but with a voting power equal to seven votes for each share.

London Electric Supply Corporation, Ltd.

The directors report a profit of £178,880 for the year ended December 31st last, as compared with £251,214. To this are added £19,700 brought forward and interest on investments, and interest and sinking fund instalments are deducted, leaving an available balance of £181,206 (against £127,595). The final ordinary dividend is 5 per cent., making 9 per cent. for the year; £50,880 is transferred to ordinary shareholders' benefit (sliding scale) fund; and £25,437 is carried forward. The sales of energy increased by over 25 per cent. to 203,711,271 kWh, and the average receipts per kWh sold fell from 1.000d. to 0.816d. The meeting was to be held on Wednesday this week.

Kensington and Knightsbridge Electric Lighting Co., Ltd.

The report for the year ended December 31st last, which was to be presented at yesterday's annual meeting, shows a net profit of £33,659, as compared with £43,869 for 1927. To this is added £15,512 brought forward, making £49,082. Provision is made for the preference dividends and the "standard" ordinary dividends; £7,544 is transferred to "special reserve fund—ordinary shareholders' benefit under the 'sliding scale' for the years 1926, 1927, and 1928"; and a balance of £10,664 is carried forward. The connected load rose from 30,064 to 32,412 kW, and the sales of energy from 14,590,141 to 16,404,067 kWh.

Bruce Peebles & Co., Ltd.

The directors state that as the profits for the past year are insufficient to justify an extra dividend on the 7½ per cent. preference shares, only the fixed dividend will be paid. The ordinary dividend is reduced from 10 per cent. to 5 per cent., and £10,000 is taken from reserve.

Midland Electric Manufacturing Co., Ltd.

The net profit for the past year was £43,402, as compared with £39,360 for 1927. The addition of £5,251 from the sale of investments and £14,314 brought forward makes available £62,967. From this it is proposed to transfer £24,274 (against £10,000) to general reserve and to pay an ordinary dividend of 10 per cent., together with a bonus of 25 per cent., making 35 per cent. for the year, against 25 per cent. for 1927. A balance of £13,193 is carried forward. The directors propose to capitalise £37,500 of reserves and undivided profits.

Isle of Thanet Electric Supply Co., Ltd.

The total revenue for the year ended December 31st last was £171,863, as compared with £160,757. The gross profit rose from £72,554 to £73,416. From this debenture interest, taxation, &c., is met, and £30,000 is transferred to general reserve and depreciation account. After crediting interest and £4,535 brought forward, there is an available balance of £29,124. The preference dividend is paid and 4 per cent. is again to be paid on the ordinary shares, leaving £6,204 to be carried forward. At the annual meeting on Wednesday last it was proposed to submit an extraordinary resolution providing for the adoption of new and more up-to-date articles of association.

W. Canning & Co., Ltd.

The report for the year ended December 31st, 1928, records a net profit of £49,215 (as compared with £43,467 for 1927). To this is added £7,031 brought forward, making £56,246. A final dividend of 7½ per cent. is being paid (making 10 per cent. for the year), as well as a bonus of 1s. per share. The dividend was the same for 1927, but the bonus was only 6d. Of the balance, £10,000 is placed to reserve and £1,000 to the employés' benevolent trust fund, leaving £9,246 to be carried forward. The meeting was to be held on Wednesday last.

British Insulated Cables, Ltd.

The directors propose to pay a final ordinary dividend of 10 per cent., again making 15 per cent. for the year. The reserve receives £400,000 (against £300,000), and £250,000 (against £305,880) is carried forward. They also propose to distribute to the ordinary shareholders one new ordinary share for each four shares already held, and three "A" £1 preference shares (ranking after the existing preference shares) for each eight ordinary shares held.

Waygood-Otis, Ltd.

The net profit for the year ended December 31st, 1928, was £77,254, as compared with £68,115 for 1927. After reserving £30,000 for contingencies and £6,000 for pension fund, and adding £12,316 brought forward, there remains £104,320. From this a final dividend of 7½ per cent. is paid on the ordinary shares, making 10 per cent. for the year (against 20 per cent.), leaving £15,570 to be carried forward. Meeting: To-day (Friday).

English Electric Co., Ltd.

The accounts for the year ended December 31st last show a net profit of £86,292, as compared with a loss of £12,237 in the preceding year. After charging debenture interest and trustees' fees there is a loss of £33,617 (against £134,404 in 1927). The report records the deaths of two directors—Messrs. Claud T. Cayley and Bernard A. Firth. The meeting is to be held on March 18th.

Newmarket Electric Light Co., Ltd.

The balance on working for 1928 was £3,748, as compared with £2,516 for 1927. A balance of £720 brought forward is added, making £4,468. A dividend of 8 per cent., free of tax, is again to be paid, and £1,500 (against £500) is placed to reserve), leaving £844 to be carried forward.

Scottish Tube Co., Ltd.

While the preference dividends are to be paid, the directors are unable to recommend any distribution on the ordinary shares, which received 7 per cent. for 1927.

Peterborough Electric Traction Co., Ltd.

The accounts for the past year show a net profit of £4,309, against £5,464 in 1927. The dividend is maintained at 10 per cent., and £4,232 is carried forward, against £4,256 brought in.

Sir W. G. Armstrong, Whitworth & Co., Ltd.

At an extraordinary meeting on March 6th the resolutions passed on February 19th providing for the reduction of the company's capital, &c., were confirmed.

Hoffman Manufacturing Co., Ltd.

From the 1928 profit of £96,994 (against £92,398) a final dividend of 6 per cent., making 10 per cent., free of tax, for the year is to be paid on the ordinary shares, as for 1927. The reserve again receives £10,000.

Elgin Electric Supply Co., Ltd.

At the recent annual meeting a dividend of 5 per cent. was declared, and it was intimated that the price of electricity for lighting purposes would be reduced from 1s. to 10d. per kWh.

Davis & Timmins, Ltd.

The net profit rose from £6,629 in 1927 to £23,417 in 1928, and the ordinary dividend is raised from 8 per cent., tax free, to 20 per cent., less tax (final 16¼ per cent.) on a larger capital.

American Telephone and Telegraph Co.

It is reported that the company intends to create capital stock to the extent of $500,000,000 to provide for future stock issues. The nominal capital will thus be raised to $2,000,000,000.

Stewarts & Lloyds, Ltd.

The profits for 1928, including £133,000 surplus on the liquidation of the South African company, amounted to £592,000, against £440,740 in 1927. The preference and preferred ordinary dividends are paid, and it is again proposed to distribute 1s. per share to the deferred shares. The reserve receives £140,000 (against £175,000).

British Columbia Power Co.

A dividend of 50 cents per share has been declared on the Class "A" shares for the quarter ending March 31st.

Canadian General Electric Co.

The dividend has been declared on the 7 per cent. preference stock for the quarter ending March 31st.

Barcelona Traction, Light and Power Co.

A quarterly dividend of 1¾ per cent. has been declared on the non-cumulative participating preference shares.

Italian Companies.

Società Adriatica Elettricità.—The company is to increase its capital to 100 million lire; the new stock will be offered to the present shareholders. The question of constructing power stations in the Balkans and Spain is being further investigated.

It is reported from Milan that the *Pirelli Italiana* realised net profits of 21.4 million lire in 1928. A dividend of 11 per cent. is to be paid on the share capital of 155 million lire, as against 10 per cent. for 1927.

The *Financial Times* reports that the *Società Generale Italiana Edison* has decided to increase its dividend to 50 lire, as against 45 lire for the previous year. The par value of the shares is to be raised to 500 lire from 375 lire by capitalising reserves. Further, shareholders are given the right to subscribe for three new shares in respect of every 19 held at the price of 565 lire each.

Swiss Company.

The *Alioth Elektricitäts Gesellschaft*, Basle, has changed its title to the Holding Brown Boveri & Cie. Aktiengesellschaft.

German Company.

The report of *Brown, Boveri and Co.*, Mannheim, states that a considerable increase in the turnover took place in 1928 and an important stock of orders has been brought over into the new year. After allocating 1,810,000 marks to depreciation, as compared with 1,580,000 marks in 1927, the accounts show net profits of 1,960,000 marks, against 1,470,000 marks, and the dividend remains at 9 per cent.

Stocks and Shares.

Monday Evening.

Restraint on the part of investment, and disinclination on that of speculation to enter upon Stock Exchange engagements except in very modest measure, are features which make for pronounced weakness in prices, as well as contraction of business. The Stock Exchange member, passing through the markets, will see more men nowadays engaged upon crossword puzzles than has been the case for many months, possibly several years, past. In spite of the quietude of enterprise in business, new concerns continue to pour out their stocks and shares at a rate which arouses the perennial wonder as to where all the money can possibly come from which supports these fresh arrivals. The big borrowers are mostly conspicuous by their absence, owing, of course, to the continuance of a financial stringency that still looks for a possible rise to 6 or 6½ per cent. in the Bank Rate. Until the financial outlook in New York shows indications of a perceptible change, money is bound to remain tight. This leads to depression and to flatness in the Stock Exchange markets. It is obvious enough that the British Government and Treasury cannot regard the present minimum with any degree of favour, inasmuch as it lays a heavy hand upon industry, and postpones the efforts that are to be made to fund the nation's indebtedness into long-dated stock.

New Issues.

That all the new issues are not finding too ready a response may be seen by the fact that underwriters in one case last week were left with 92 per cent. of their liability. In another, they had to take 74 per cent. of the stock. Yet this present month promises to break records in the number of new companies whose shares are offered for public subscription. Last week's issue of Kolster-Brandes shares was overwhelmingly written for, and the lists opened only to close almost immediately.

The Late Sir John Denison-Pender.

The death of Sir John Denison-Pender, which occurred very suddenly, he having been in the City on the Friday before he succumbed to influenza and bronchitis a few days later, is greatly regretted amongst Stock Exchange men who knew and respected him. Sir John was regarded in a sense as being the head and front of the cable industry. Chairman of the Eastern Telegraph, Eastern Extension, Globe, Western and various other cable companies, he occupied a unique position in the cable world, and City men regarded him as being one of the soundest of the authorities on all questions relating to the industry with which his name will always be identified. The news of his death was followed by a slight weakening of prices in the stocks and shares of the companies connected with the industry, though it is taken for granted that arrangements have been made to prevent any large amount of stocks and shares coming on to the cable market as a result of his death. Declines in the leading stocks of the cable group are due to sympathy with the prevailing flatness elsewhere, and to dissatisfaction felt with the delay in making the announcement in regard to the Communications Company.

Marconi and Gramophone.

Activity developed in Marconis on the announcement that the company has entered into an arrangement with the Gramophone Co. (H.M.V.), which is to all intents and purposes a merger of certain interests with which both companies are closely connected. In the Gramophone Company, the Victor Talking Machine of America holds a majority of shares, and the latter company has joined forces with the Radio Corporation. Marconi shares, after being 78s., rallied to 81s. 3d., but reacted to £4, leaving the price without alteration on the week. Marconi Marines have further fallen to 3¼ on continued disappointment with the dividend of 15 per cent. Canadian Marconis rose 10 dollars in New York, and reflected this with a jump of 4s. 9d., to 38s. 9d. on this side.

The P.M.G. and Television.

The Postmaster-General is reported to have stated in the House of Commons that with regard to the wireless and cable merger, in so far as the Post Office was concerned, he believed the drafts were being considered by the associations interested. He did not think, according to this statement, that the Merger Company had yet been formed. The last statement aroused comment, and a wonder as to whether the Postmaster-General had been correctly reported. That same Minister was present at a demonstration of the Baird Television system, given recently, and afterwards an announcement was issued to the effect that the Postmaster-General would have to consider, and there is likely to be some considerable time before a statement can be made concerning the secret tests carried out in connection with the scheme. The price of Baird shares is dull at 5s. 9d.

Electric Lighting Shares.

County of London Electrics fell 3s. to 2¼, upon less exuberant dividend anticipations than were current last week. Bournemouth and Poole are 1/16 easier, at 68s. 3d. The City of London Electric Lighting repeats its previous distribution that makes 10 per cent. for the year, setting aside £45,989 to a special reserve out of the money which the company is entitled to retain under its sliding scale. The shares are unchanged at 32s. London Electrics are also without fluctuation at 27s. 6d.; the company is paying 9 per cent. for the past year, and transferring £50,880 to special reserve for the three years 1926-1928 inclusive. This fund is, of course, for the benefit of the ordinary shareholders. Midland Counties at 27s. 6d. ex dividend are about 1s. down, although the chairman at last week's meeting gave illuminating statistics of the company's expansion in sales and in the number of its customers. The company's tramway business presents difficulties, but an improvement in conditions was referred to in the chairman's speech. Isle of Thanet ordinary at 39s. and the preference at 29s., North Metropolitans at 49s., and Atlas Light and Power at 28s. 6d. have receded from the best prices recently reached. Newcastle-on-Tyne ordinary gave way to 25s., there having been an impression that the 1927 dividend of 6 per cent. might have been improved upon, whereas the same distribution is to be made in respect of 1928.

Mexican Revolution.

Revolution in Mexico is the latest news from that distressful country. The rebels, acting under a General Aguirre, were said to have taken the City of Vera Cruz. They claimed that eight States in Mexico favoured their cause, and a strict censorship in Mexico City has rendered it difficult to get authorita-

tive news. The immediate effect in the Stock Exchange was to bring about a fall of 11 points in Mexican Light and Power common shares to 80, and to spread depression amongst the other utility issues of the Mexican group. Mexico Trams dropped to 52, and the company's first mortgage bonds to 77½.

The Shawinigan Water and Power Company reports a gross revenue for 1928 of 11½ million dollars, being more than two million dollars higher than that for 1927. The net revenue comes out at 4 million dollars. A new issue of capital is to be made to shareholders of 50 dollars per share, on the basis of one new share for every six shares held. Although, on this, the price of the old shares went back to 88½, the bonus is considerable. The company is paying quarterly dividends of 2 per cent. per annum. Montreal Light, Heat and Power shares eased off to 113.

Tubes and Traction.

Underground Electric Railways of London are again easier on account of the fears raised by the rise in petrol prices. Lord Ashfield made an optimistic speech at the meeting last week, but said that the extra price of petrol will cost the Underground Railways Company about £200,000 per annum. He remarked that whereas a mile of tube railway in London cost £850,000 and a mile of tramway £50,000, the equivalent for the omnibus system is £15,000. Underground shares are dull at 24s., and the incomes shed 5 points to 110. Metropolitan Consolidated and Districts, both ex dividend, are decidedly weak. No changes have occurred in London United Tramways or in London and Suburban Tractions.

Brazilian Tractions lost 4½ points, receding to 66. Further persistent buying of Anglo-Argentine Tramways second preference has lifted the price to 4, making a gain of 7s. 6d. on the fortnight. Para Electric Railway shares put on 2s., with an advance to 7s. 6d., and the company's first debenture stock at 73½ is 3 points up.

General Electrics.

The General Electric Co., Ltd., proposes, as mentioned on p. 439 of last week's Electrical Review, to increase its capital from the present £6,000,000 to £7,600,000, by the creation of 1,600,000 new shares of £1 each. The money is to be raised partly with the idea of redeeming the existing seven per cent. debenture stock, and partly for purposes connected with the company's business. The new shares are to be called British Ordinary, and will be offered to the public. The meeting to sanction the issue is being held on the Wednesday of this week, and the price is to be 42s. per share. The existing shares have been moving up and down in erratic fashion, and on the week show a loss of 10s. at 2¾. A cable of protest from a committee of G.E.C. shareholders in America elicited a reply from Sir Hugo Hirst, chairman of the company, in which he defended the board in its determination to remain the "ultimate arbiter in guiding the company's affairs." It will come as a surprise to many people to learn from Sir Hugo Hirst's cable that Americans hold about 60 per cent. of the shares of the General Electric Co., Ltd.

British Insulated Bonus.

An issue of another kind, which will give satisfaction to the holders of the company's shares, is a bonus to be distributed by British Insulated Cables. Holders of the existing ordinary shares will receive one new ordinary share for every four shares held, together with three 5½ per cent. "A" preference for every eight ordinary shares held. The latter preference shares are to be created for the purpose of the bonus, and will rank behind the existing 6½ per cent. preference capital. The two new issues together add £833,331 to the company's capital. A final dividend of 10 per cent. makes 15 per cent. for the year, as before, and the appropriations have been generously dealt with. The effect of the announcement was to advance the price to nearly £5 a share, from which it reacted to 95s. Rumour has been suggesting for some time past that a bonus issue might be expected, and the present statement must be considered as good as anything for which optimism could have hoped. Enfields lost ¼, failing to maintain their rise on the good report and melon-cutting already referred to here. Yorkshire Electrics are 6d. down at 35s. 6d. Probably the new issue of shares at 25s., three now being offered for every four shares held, will be out during the present week.

The Manufacturing Companies.

The English Electric Company reports a net loss on the past financial year of £33,000, the kindest thing about which can be said is that it is £100,000 less than the net loss of the previous twelve months. The debit balance is increased to £433,516. The ordinary shares are quoted at 8s. 3d., and the preference, upon which no dividend has been paid since June, 1926, at 9s. 6d. Electric Constructions weakened to £1. On the other hand, Telegraph Constructions changed hand at 26, and at 25½ are 5s. better on balance. Brush ordinary slipped back to 27s. 6d. Iron, coal and steel shares are fairly well maintained, considering the weakness that has over-spread most of the industrial sections. Rubber shares have gone back a trifle by reason of the produce reacting to a shade above a shilling per lb. Ever-Ready shares are dull at 22s. 6d., and the Trust Company's shares at 18s. 9d. are not a very lively market. Telephone Manufacturing at 5s. 9d. show a few pence decline.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom. £	Dividend. 1926.	1927.	Price March 11 1929.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	14†	15	68/3	—1/3	... ...
Brompton Ordinary	1	8⅝	8½	27/-	—	5 3 8
Charing Cross Ordinary	1	8½	8½	26/-xd	—	5 7 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8⅝	8⅝	27/-	—	5 3 8
City of London	1	10	10	32/-	—	4 7 6
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	2	—	4 2 0
County of London	1	7½	7½	2½	—3/-	3 0 0
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundsons' 7% Pref.	1	7	7	25/-	—	5 12 0
Elec. Supply Corporation	1	11	11	56/3	—	3 18 3
Kensington Ordinary	1	8	8	27/-	—	5 3 8
Lancs. Light and Power	1	7½	7½	30/-	—	5 0 0
London Electric	1	8½	8½	27/6	—	5 1 10
Metropolitan	1	8	9	2 7/16xd	—	4 2 2
do 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	27/6xd	—1/-	4 8 2
Mid. Elec. Power	1	—	15	2 1/16	—	... ...
Newcastle-on-Tyne Ordinary ...	1	5	6	1½	—1/16	4 16 0
do. 7% Pref. ...	1	7	7	26/6	—	5 5 8
Notting Hill 6% Pref.	10	6	6	10⅝	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	1	8	8	27 6xd	+6d.	5 1 10
Scottish Power	1	8	8	32/8	—6d.	4 15 7
South London	1	8½	8½	27/6	—	5 2 8
Urban Ordinary	1	7	7	44/6	—	... ...
Westminster Ordinary	1	8½	8½	26 6xd	—	5 5 8
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	34/6	—	5 1 8
Yorkshire Elec.	1	8	8	35/3	- 6d.	4 10 2

†4% of which was tax free.

Home Rails.

Central London Ord. Assented ...	Stock	4	4	72	—	5 11 1
Metropolitan	,,	8	8	160xd	—1½	5 16 8
do. District	,,	8½	4	76½xd	—2	5 10 9
Underground Electric	£1	1½	5	24/-	—1/-	5 16 8
do. do. Income ...	Bonds	6	6	110	—5	5 9

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	108	—	5 16 8
do. Def.	,,	1½	1½	24½	—	6 3 9
Automatic Telephone	1	10	10	2½	—	4 14 1
Eastern Extension	10	10	10	23⅝	—½	*3 18 2
Eastern Tel. Ord.	Stock	10	10	220	—3½	*3 17 0
Globe Tel. and T. Ord.	10	10	10	26	—⅜	*3 15 9
do. do. Pref.	10	6	6	11½	—	5 9 0
Great Northern Tel.	10	20	20	32½	—	... ...
Indo-European	25	10	10	15½	—	*4 10 0
Marconi	10/-	5	*10	4	—	... ...
Marconi-Marine	1	8⅝	12½	8½	—⅛	4 12 4
Oriental Telephone Ord. ...	1	12	12	3	—1/16	... ...
Western Telegraph	10	10	10	25⅛	—¼	3 18 2

*Interim.

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8¼	—	7 1 11
do. do. 2nd. Pref. ...	5	6	6	4	+1/16	7 10 0
do. do. 5% Deb. ...	Stock	5	5	75	—	6 13 4
British Electric Traction Def. Ord.	,,	—	—	925	—	... ...
do. do. Pref. Ord.	,,	8	8	128	—	6 5 0
Brazil Traction	100	6	7	66	—1½	3 0 8
Brit. Colombia Elec. Rly. Pcs. ...	Stock	5	5	96½	—	5 3 7
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	12/-	—	... ...
London United Tram Deb. ...	Stock	4	4	61	—	6 11 4
Mexico Trams, 5% Bonds	—	5	5	82	—	5 15 0
Mexican Light Common	100	Nil	Nil	80	—11	... ...
do. 7% Pref.	100	Nil	7	76½	—1	9 3 0
do. 1st Bonds	—	5	5	79	—1	6 6 7
Yorkshire (West Riding)	1	Nil	Nil	8/-	—	... ...

Manufacturing Companies.

Babcock & Wilcox	1	18	15	3½	—	*4 11 5
British Aluminium Ord.	1	10	10	46/3	—	*4 6 7
British Elec. Transformer Pref....	1	7	7	15/-	—	9 6 8
British Insulated Ord.	1	15	15	4⅔	—	8 8 3
Brush Ord.	1	10	10	27/6	—1/16	7 5 6
Callenders	1	15	15	4½	—	6 10 9
do 6½% Pref.	1	6½	6½	1½	—	5 4 0
Crompton Parkinson Ord.... ...	6/-	—	—	1	—	... ...
do. 8% Pref.	1	—	8	25/9	—	6 4 3
Edison-Swan 1st. Pref.	1	7½	7½	25/9	—	7 1 2
do. 5% Deb.	Stock	5	5	86½	—	5 15 7
Electric Construction	1	7½	7½	1	—1/16	7 10 0
Enfield Cable Ord.	1	20	20	6½	—¼	3 14 6
English Electric	1	Nil	Nil	8/3	—	... ...
do. do. Pref	1	8	Nil	9/6	—	... ...
Gen. Elec. Pref.	1	6½	6½	24/6	—	5 6 1
do. Ord.	1	7½	10	22	—½	9 12 9
Henley	1	25	25	6	—1/16	4 1 8
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	11/3	—	... ...
Johnson & Phillips	1	12½	10	14⅝	—	5 8 1
Siemens Ord.	1	7½	7½	1⅝	—	5 9 1
Telegraph Construction	12	10	10	25½	—	*4 14 8

*Dividends paid free of Income Tax.

The Brazilian Electrical Market.

An Official View of British Prospects.

IN a recent issue* the electrical markets of Argentina, Chile and Peru were surveyed. It is now possible to review business conditions in the Brazilian market, which is larger in actual area than either of those mentioned, but one where the prospects for British trade, if not definitely less promising, are at any rate more obscure than in the other countries. This information is contained in the recently-issued D.O.T. report on the financial, commercial and economic conditions in the republic by Mr. Stanley G. Irving, Commercial Secretary, at Rio de Janeiro (Stationery Office, price 3s. 6d. net).

Estimating the amount of foreign capital invested in Brazil at over £500,000,000, it is calculated that £300,000,000 of this came from Great Britain and Canada. On the theory that trade now follows finance, whereas formerly it followed the flag, the question arises: What benefits have accrued to British manufacturers and exporters from this investment of capital and from the risk and enterprise which it represents? Mr. Irving is doubtful whether the proportion of the total exports to Brazil representing orders from British controlled companies amounts to as much as 10 per cent. This statement, considered in conjunction with the growing movement on the part of American financial interests to acquire electricity supply undertakings hitherto under British control, gives rise to serious reflection. It is true that a condition of some of these acquisitions, *e.g.*, that of the Atlas concern, Light & Power Co., is that preference shall be given to British manufacturers for a certain period, but much will depend upon the interpretation of the term "preference." At the same time there has been a new development recently in connection with great financial concerns such as are likely to participate in electricity supply undertakings, *i.e.*, their very wide international ramifications. Of this feature, the Belgo-international "Sofina," with which Mr. Dudley Docker has recently become connected, is an outstanding example. In the case of control by a group representing virtually every manufacturing country, it is fair to assume that orders will be placed on merit alone.

The matter of securing a return on the investment of capital in its primary aspects, *viz.*, rate of interest and security, is also dealt with by the Commercial Secretary. He admits that the Brazilian Government has generally followed a farseeing policy with regard to the entry of foreign capital, but adds that the direct return to the original investors has been disappointing, in some cases owing to errors of judgment, in others to political causes. There are instances of foreign capital having been borrowed and spent without leaving any tangible asset in its place.

The long contemplated revision of the customs tariff is not yet complete. Certain textile duties have been raised and there has been a reduction of 10 per cent. in the rate on certain railway material. But it is highly desirable to remove the great number of *ad valorem* duties, of which unscrupulous competitors are able to take advantage in order to evade full payment by the use of fictitious invoices. Although nearly all articles are subject to a duty of over 50 per cent. upwards to as much as 200 per cent. of their value, the revenue from import duties at present amounts to only about 25 per cent. of the total value of the goods imported. "The revision of the tariff (says the Commercial Secretary) will provide an opportunity for the Brazilian Government to remove the opportunities for fraud offered by the *ad valorem* system, and so to protect the national interest."

Electrical Import Trade.

Summarising the general trend of the electrical import trade, more detailed statistics of which are appended, Mr. Irving remarks:—

The electrical machinery trade is largely dependent on the requirements of the Brazilian Traction Co. and the Electric Bond & Share Co., which is associated with the (American) General Electric Co. Imports of transformers increased from £170,000 in 1926 to £207,000 in 1927, Britain having become the chief supplier in front of Germany and the United States. In 1926 the United States supplied more than half the total. Electric motors increased from £242,000 to £250,000, the United States being the chief supplier in both years, Germany next and Great Britain third, losing ground. There is an appreciable trade in steam turbines for the larger industries in the northern States, Sta. Catharina and Rio Grande do Sul, in addition to the big plants in the Sao Paulo and Rio de Janeiro region.

Copper wire (insulated) in 1927 came chiefly from the United States and Germany in the proportions of 50 per cent. and 30 per cent. respectively out of a total of £85,000, a slight increase on 1926. The local production of copper wire is increasing. The largest item of copper products imported is cables, which amounted to 2,500 tons, valued at £188,340, in 1926, and to 2,940 tons, valued at £207,560, in 1927. Great Britain, after having held a good lead with 38 per cent. in 1926, fell back into second place with 27 per cent., close behind the United States. The biggest advance was shown by Germany, whose trade increased from £9,200 to £28,000. Belgium was fourth. The tonnage figures were: Great Britain 928 tons, United States 532 tons, and Germany 528 tons. The United States supplies most of the telephone cables and h.p. wires.

Electric lamp imports in 1927 amounted to £178,750, an increase of 32 per cent. over 1926. Nearly all the imported lamps come from Germany and Holland. There is a flourishing national factory of these goods under the control of the General Electric Co. of New York.

The following table shows Great Britain's position in relation to other important suppliers of electrical goods in 1913, 1926, and 1927:—

Apparatus and appliances for electric lighting—	1913.† Met. Tons.		1926 Met. Tons.	Value in 1,000 £	1927. Met. Tons.	Value in 1,000 £
Great Britain ...	1,510		670	195	759	173
United States ...	2,940		2,131	496	2,162	531
Germany ...	2,010		1,214	172	1,183	180
Others	600		694	123	1,113	179
Total	7,060	(£690)	4,709	£986	5,217	£1,063
Electric dynamos and generators—						
Great Britain ...	100		53	16	70	15
United States ...	370		461	73	610	97
Germany	170		476	52	373	29
Others	120		291	41	292	53
Total	760	(£61)	1,281	£182	1,345	£194
Electric motors—						
Great Britain ...	210		231	40	205	35
United States ...	465		346	70	494	93
Germany	480		583	54	379	30
Switzerland ...	165		102	15	108	18
Italy	85		151	15	121	15
Others	85		493	48	298	53
Total	1,490	(£123)	1,906	£242	1,605	£244
Transformers—						
Great Britain ...	40		114	16	261	37
United States ...	795		637	97	759	110
Germany	150		310	21	265	28
Others	25		256	31	241	22
Total	1,010	(£84)	1,317	£165	1,526	£207
Electric cables and wire (insulated)—						
Great Britain ...	1,287		1,345	95	951	59
United States ...	1,242		878	91	709	85
Germany	754		295	24	706	46
Italy	171		249	19	586	35
Others	171		430	40	590	47
Total	3,625	(£259)	3,197	£269	3,542	£272

Marketing Methods.

Mr. Irving has already formed strong opinions on the subject of marketing methods, and he tells the British manufacturer who contemplates establishing trade relations with Brazil that in order to have any chance of success he must be prepared to sacrifice preconceptions and approach the problem with an open mind. He starts, however, by endorsing the usual method employed by manufacturers, *viz.*, through merchant shippers in the United Kingdom having their own branch or agent in Brazil. After discussing this procedure in some detail he deals with certain other methods, *viz.*, selling through agents in Brazil directly representing the manufacturer; selling direct to local merchant firms; and selling to buying agents in Europe of large firms in Brazil. Among the points he makes are that unless the goods are well-known in Brazil or the agent has exceptionally good personal connections, stocks and advertising are essential if results are to be satisfactory, especially

* Elec. Rev. Feb. 8th, 1929, p. 253.

†Figures for 1913 show weight and total value (in brackets in 1,000's £) only.

in heavy goods. The ordinary commission agent registered as such and paying an agent's licence only, cannot present tenders for Government contracts in public competition, unless holding his principal's power of attorney to represent fully. Otherwise he must employ a locally-established firm for the purpose.

It should be noted that the large Brazilian dealers prefer, as a rule, to buy from the local agents of European and North American manufacturers, a tendency which is increasing daily as the choice becomes greater; and, further, that representatives of most of the leading manufacturers of the world are now to be found in Rio, prepared to quote at a moment's notice. Consequently the need for keeping local stocks is becoming increasingly pronounced. When local contractors and engineers can conveniently buy at their own door, they will not go to the trouble of writing or cabling their requirements abroad, with the long delays involved and the troubles connected with bills of exchange and clearance through the Customs, to which is added, in many instances, the disadvantage of buying unseen and untried goods from a catalogue. The customer's reply to an agent who tries to sell to him from a catalogue is generally, "Can you show me one working here?" This applies especially to machinery, the selection of which may easily depend on the personal preference of a mechanic who is to work it.

Combined Selling Agencies.

In the circumstances the Commercial Secretary recommends the adoption of a scheme similar to that followed by Continental and United States manufacturers of non-competitive goods who have opened showrooms for their agents and have deposited goods on consignment in charge of capable men sent out to demonstrate them. The experts attached are prepared to furnish plans and information as to the working of new machinery or other products conditionally on receiving the order or preferential treatment. Mr. Irving says that a large amount of entirely unused British machinery has been thrown on the scrap heap because no one knew how to work it or even how to set it up. At the same time he commends the example of the British textile machinery makers, whose technical representatives visit the factories, suggest what machinery would be suitable and see that it is properly installed.

United States Activities.

Appended to the Commercial Secretary's report is one by the Consul-General at Sao Paulo and the Vice-Consul at Santos, in which there is given an interesting *résumé* of the operations of the Rio and the Sao Paulo Light and Power companies, now merged in one concern. After the drought of 1925, the principal companies doubled their capacities, for which purpose a considerable amount of capital had to be obtained from outside sources. The opportunity was not lost by American electrical manufacturers, who commenced to purchase the controlling interest in numerous undertakings. The combined Rio and Sao Paulo companies purchased controlling interests in most of the power undertakings operating between the city of Sao Paulo and that of Rio de Janeiro. It is found that the power undertakings purchased give an average net return of up to 12 per cent. on the capital invested, with prospects of a substantial increase as units come into operation and the demand increases. The prices charged for power in some areas are also low and will probably be increased as concessions are renewed. In addition there must be considered the substantial orders accruing to the manufacturers of electrical material through the expansion and re-organisation of such a large power network. To the Consular officers it seems essential for the development of British trade in Brazil that responsible directors should seize opportunities by personally studying the country and then giving more confidence to their local representatives. Americans and Germans have adopted this policy with great success.

The following striking example of the way in which American interests are spreading is given :—

In December last a concession was granted to the Sao Paulo Tramway, Light and Power Company, Ltd., for the development of a system of transport of goods between the capital of this State and the coast. This project, if materialised, will form a further outlet for the power which the company is developing at its huge station at Cubatao, which lies at the foot of the coastal hills near Santos. Two units of 40,000 h.p. each are already working and it is anticipated that a third unit will be installed within two years. Reservoirs already constructed for the storage of the flood waters in order to supply the power of the station at Cubatao will now serve a dual purpose in providing a waterway for the carriage of merchandise from the city to the edge of the coastal hills as well as furnishing the power. On September 19th the first half of the power plant (10,000 h.p.) of the Cia. Central Electrica de Icem at the Marimbondo Falls, on the north-west boundary of the State with Minas Geraes, was inaugurated. There is a fall of 19 metres and the plant has been planned to furnish 20,000 h.p. when completed. An area amounting to practically one-third of the area of the State is now served by companies belonging to the Empresas Electricas Brasileiras S.A., owned by an American corporation.

It may be added that from practically every business centre in Brazil comes the criticism that British firms are far behind their competitors in advertising and propaganda of every kind.

Developments and Prospects.

In Brazil great reserves of water power remain to be developed. The increasing needs of Rio de Janeiro, Sao Paulo, Santos, and the surrounding districts, are supplied by the well-known Canadian company to which so much of Brazil's progress is due. Eighty per cent. of the factories in the States of Rio de Janeiro and Sao Paulo are run by electricity. But power development ceased to depend solely on the Canadian company since it engaged the attention recently of powerful United States electrical interests, who have lost no time in establishing themselves. They have already taken in hand public services in Pernambuco, Bahia, Porto Alegre, Victoria, Nictheroy, and certain small towns in the State of Sao Paulo. All the principal cities of Brazil are in fact provided with electric lighting and tramway services, and there is one electric railway, the Paulista. Yet out of the total water power resources estimated at 25,000,000 h.p., only 500,000 h.p. has as yet been developed. Great as is the potential wealth and the area of the country, it is far from ripe for rapid development. Transport facilities are one great need. Another is to find additional export assets to coffee, on which at present the prosperity of Brazil depends too greatly. And without the former it is difficult to promote the more extended cultivation or marketing of maize, sugar, tobacco, cotton, rubber and animal products, all of which offer moderate possibilities.

Norwegian Imports.

In the following statement are shown the imports during 1927 and 1926 of electrical and allied material into Norway, together with a note of increases or decreases in value. The countries of origin of certain groups of apparatus are given, but the official statistics, on which the statement is based, do not supply this information in many instances.

	1926. 1,000 Kroner.	1927. 1,000 Kroner.	Inc. or dec. 1,000 Kroner.
Internal combustion engines ...	2,292	1,579	−713
Electric motors valued each at—			
(1) less than 1,500 kr.	819	1,074	+255
(2) 1,500 kr. or more	1,151	967	−184
Total*	5,038	4,726	−312
From Sweden	1,713	1,182	−531
,, Denmark	417	289	−128
,, Germany	1,872	1,881	+ 9
,, United States	553	535	− 18
Electric generators—			
Transformers valued each at ...	776	1,106	+330
(1) less than 3,000 kr.	150	139	− 11
(2) 3,000 kr. or more	217	491	+274
Switchgear, &c.	177	222	+ 45
Convertors (rotary)	246	245	− 1
Other electrical machinery and apparatus of a kind not manufactured in Norway	1,308	979	−329
Lampholders with or without switches†	117	73	− 44
Switches, &c., for household purposes—			
Total	275	255	− 20
From Germany	228	221	− 7
Other electrical machinery and apparatus of a kind manufactured in Norway—			
Total	1,250	1,844	+594
From United States	121	137	+ 16
,, Sweden	574	718	+144
,, Denmark	128	115	− 13
,, Germany	356	741	+385
Carbon brushes—			
Total	86	104	+ 18
From Sweden	11	8	− 3
,, Germany	29	25	− 4
,, Great Britain	25	56	+ 31
,, France	8	8	—
Electric cable and wire—†			
(1) lead covered	1,407	1,257	−150
(2) other, insulated	555	453	−102
Total	1,962	1,710	−252
Accumulators and parts	636	717	+ 81
Batteries and parts	561	572	+ 11
Electric lamps	1,861	2,531	+670
Electrical apparatus (including telephone and telegraph)	1,529	1,886	+357
Electric meters	172	197	+ 25

* Includes generators.. † Mainly from Germany.

Catalogues: A Reply.

The Point of View of the Compiler.

By R. J. WILLIS (Publicity Manager, Sun Electrical Co., Ltd.).

THE recent article by Mr H. R. Taunton, dealing with the inconvenience of electrical trade catalogues (ELEC. REV., February 15th, p. 275) was so obviously written from the contractor's point of view that some details of the difficulties facing the compiler of one of these much-maligned volumes seems to be called for.

Of the thousands of electrical contractors who regularly receive catalogues, how many give a thought to the immense amount of work entailed in their compilation, the problems to be solved, the uncertainties to be overcome, before the finished article reaches their bookshelves—or their waste-paper basket? It is the sole concern of the publicity manager of the firm issuing the catalogue to make his catalogue as interesting and as convenient as possible to all electrical buyers. Unfortunately he cannot please everyone. What is to one an essentially simple lay-out, is obscure and irritating to another, and a complete mystery to the uninitiated. I am considering, of course, only fairly large catalogues in which there are a dozen or more different sections devoted to a wide range of material.

The first problem to be considered is external appearance, i.e., size, colour and design, binding and division of sections. The colour is of paramount importance, for if the completed publication is deficient in "eye-value" it will suffer in comparison with its more attractive companions on the contractors' bookshelves and will not readily catch the hasty eye. If the colour is bright, a simple but dignified design must be adopted, otherwise a cover design sufficiently striking to make amends for a mediocre colour is necessary. An abbreviated title should always appear on the spine. As regards the binding, so long as it is stout enough to withstand rough usage and will allow the book to stand on end without support it is satisfactory. These problems scarcely affect the user; he may subconsciously note them, but he will only be aware of whether he is favourably impressed or not.

Size and Sections.

It is when he comes to consider size and division of sections that the compiler's real troubles begin. Is there a correct size for a catalogue? One has only to look at the uneven dressing of the volumes on an electrical buyer's shelves to realise the multiplicity of sizes possible. Presumably all these volumes are thought by their publishers to be convenient; yet some sizes must be easier to handle than others, and it naturally follows that those less easy to handle will be the less used. I consider that the ideal catalogue should not be too bulky to be carried about, but at the same time should be of sufficient size to maintain its place on the shelf among more pretentious lists. This is, of course, only a personal opinion, and what the compiler wants for guidance is not his own idea but the consensus of opinion among users.

Turning next to the division of sections we shall see that here the matter is not so much one of uncertainty as one of economy. The best method of sub-division is to use either a thumb index or projecting tabs. Both systems are, in the main, satisfactory, the only disadvantages from which they suffer being that where tabs are employed they are invariably used as levers to open the list with the result that eventually they become detached, while the constant insertion of the thumb in a "cut-away" index tends to obliterate the imprint and even to wear away the exposed portion of the pages entirely. Obviously, one can have specially stout tabs strongly affixed to a thick interleaved board—or even a glazed surface over the exposed portion of the thumb index—but the cost is absolutely prohibitive for a large catalogue. To have each section printed on paper of a different tint is a good method, but where there are 20 or more sections, it is almost impossible from an economical point of view, quite apart from the difficulty of finding a sufficient number of contrasting tints in the ranges of paper usually available. One other method remains, and that is to have the title page of each section printed on a thick board. This is not a costly method but, in practice, it is most unsatisfactory. It is not visible and the user will soon find that the thick boards prevent him from running rapidly through the list by letting the pages fly from under his thumb.

Faced on the one hand with the desirability of economy and on the other with the need for convenience to the user, the compiler's sole remaining resource is to leave as much white space as possible on each title page; to arrange each section so as to facilitate rapid reference; to refer on the outside cover to the contents page, giving the page numbers for each section, and finally to have a really effective alphabetical index.

The Problem of Sequence.

Having settled the external appearance of the catalogue there still remains the even more important matter of the arrangement of sequence. With a comprehensive list covering the whole range of electrical supplies from accessories and sundries to line material and plant, this is a matter of some difficulty. Decidedly the whole list cannot be laid out in alphabetical order. No one could seriously suggest that "tumbler switches" should be listed with "ironclad switchgear" or "lamps" with "line material." Nevertheless, since order must be maintained, the list can be divided up into sections and the sections themselves arranged in such a sequence as naturally to follow one another. Then the contents of each section must be arranged in some easily remembered order.

A further difficulty in the alphabetical arrangement of accessories is that one first of all has to determine under what initial letter the user would look for, say, "adjustable grid boxes" or "wall sockets and plugs." Even assuming that this problem could satisfactorily be solved there would then arise the question of keeping the illustrations to scale or at least approximately to scale. One has only to place scale illustrations of a screw and a switch-plug side by side to gain some idea of the resultant confusion and absurdity.

No matter how large a catalogue is, providing it is well sectionalised and there is no referring from one section to another to complete the price of an article, it is only a matter of seconds to find any required item. There are, unfortunately, some catalogues in which tumbler switches are listed in one section, finishes in another, and the appropriate flush plates in a third, with separate price sheets for all three. These are, however, the exception rather than the rule, and it is decidedly unfair to pillory some of the excellent lists issued by electrical manufacturers and wholesale distributors because of the eccentricities of the minority.

Prices and Discounts.

Coming next to page arrangement there are still more difficulties to be met. The subtraction of discounts is admittedly a nuisance, but unless a flat rate discount is allowed on the whole catalogue (an impossibility with a large list) one is forced to give a codified discount against each price or range of prices. So long as the code is simple and does not require constant reference to the explanation it will work admirably in practice, but if the code is too complicated it is worse than useless to the hurried estimator. The suggestion recently made in these columns that net prices should be inserted is an excellent one and would save endless fuss and bother both to the issuer and to the user. To the estimator, however, it would not be such a time saver as at first appears, since if he has not to subtract a discount he has at least to add one, and I fail to see that the addition of a percentage to a net price is any less difficult than the subtraction of a discount from a retail price. I suggest that this point was overlooked in the article referred to.

In addition, there is the retail price to consider. Most manufacturers insist on their retail prices being maintained, but if they were to print net figures in their catalogues they could scarcely persist in this attitude. All things considered, the retail price with a codified discount plainly marked is the best, and when it is remembered that the E.C.A. and other trade associations are definitely adverse to the issue of catalogues giving net figures it is obvious that any publisher of a catalogue who broke these rules would meet with a rather hostile reception.

Quite apart from the discount question there is the arrangement of tabular matter. Here there is only one sensible arrangement and that is with the tabular matter reading from left to right, preferably commencing with a reference number and concluding with a price, both of which should be printed in bold-face type, the other columns being light-face. As regards price corrections and revisions subsequent to the issue of the catalogue, no really satisfactory arrangement has yet been devised. The suggestion that the representatives of the firm publishing the catalogues should personally make the corrections is a good one, but in that case there would be some on the representative's ground who would not hear of a price revision for weeks.

The issue of the catalogue concludes the publicity manager's troubles and anxieties for a time, but he is still left in doubt as to what the user considers the best arrangement. With an eye to the next issue of his catalogue he is still puzzled to discover what the consensus of opinion regards as the ideal catalogue, and it would be interesting if some means could be devised whereby his perplexity could be removed.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

Switchgear-Unit Panels.

Fig. 1 shows a "Simplex" standard unit panel, a recent introduction of Simplex Conduits, Ltd., Garrison Lane, Birmingham. These panels have been produced to enable the convenient use of "Simplex" standard switch and fuse gear at the "nerve-centre" of an installation—the main switch panel. All main or sub-main gear can, if desired, be grouped together on this principle, supervision and control being thus greatly facilitated. The panels consist of a stout angle-iron

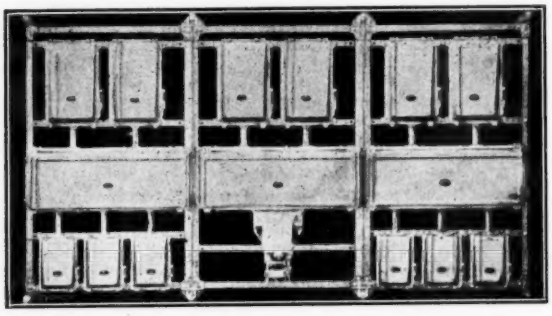


Fig. 1.—"Simplex" Standard Unit Panel.

framework, specially constructed to make erection or dismantling an easy matter, on which any arrangement of standard units can be mounted. The new panels are claimed to be a great advance over the old open types, in that they can be built in less time and at less cost. Any desired combination can be effected with equal ease. They give, it is claimed, the maximum of safety, as all live parts are totally enclosed, and it is therefore possible to install them in situations where open-type panels would be dangerous.

Paint-Spraying Equipment.

The B.E.N. Patents, Ltd., 92, Tottenham Court Road, W.1, have recently introduced a paint-spraying unit, fig. 2, consisting of an air-cooled compressor with a displacement of 4 cu. ft. per min. at 120 lb. per sq. in., with the necessary driving unit and auxiliaries. An air receiver is fitted with a pressure gauge, safety and needle valves, and also a plug in the base for draining off condensed moisture, &c. Electric

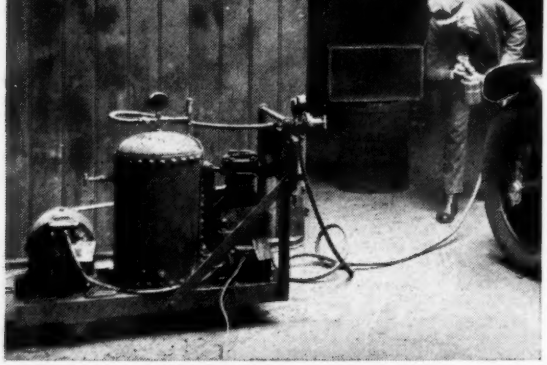


Fig. 2.—B.E.N. Paint-spraying Equipment.

driving is provided by a ¾-h.p. motor (compound-wound for d.c., or repulsion-induction for a.c.).

Automatic control is provided by means of an electro-pneumatic switch. This control maintains a constant tank pressure at all times, the motor cutting in when the pressure falls, and out when it rises again to the maximum. The spray gun used with the equipment utilises a new principle, requiring only 3½ cu. ft. of air per min. for good atomisation. It is claimed that the gun produces a perfectly smooth finish, free from pitting.

A New Lighting Fitting.

The latest production of British B.A.G., Ltd., 23, Farringdon Avenue, E.C.4, is the "Pearlite" diffuser, fig. 3. It is a totally-enclosed lighting unit of spherical shape, with a pleasing white matt finish, and with slightly projecting relief segments, although plain globes can also be supplied if required. The fitting can be supplied in either the ceiling or the pendant type; the latter is supplied with a suspension chain, or with flex alone. The brass ceiling plates, chains and galleries are specially solidly constructed and can be supplied in various finishes, such as matt brass and oxidised silver or copper. There are three sizes, 8-in. diameter for use with 60 to 110-W lamps, 10-in. for 100 to 150-W lamps, and 12 in. for 150 to 200-W

Fig. 3.—"Pearlite" Diffuser.

lamps. The overall height of the pendant types is 40 in., while the overall heights of the ceiling types are 9½ in., 11½ in., and 13½ in. for the three diameters, respectively.

A 3-pin Switch Plug.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2, has recently placed on the market a double-pole double-break interlocked earthed-pattern 3-pin switch-plug designed for 15 A at 250 volts. This accessory, which is of very robust construction, fully complies, it is claimed, with the I.E.E. Regulations. The switch is of the underslung type, having a long throw with rapid make and break, and the whole mechanism, together with socket tubes, is mounted in a solid English vitreous porcelain base. The dimensions of the face plate are 5 in. by 3 in. This plate is of heavy-gauge brass, and can be fitted either flush with the skirting board, or semi-recessed with a teak surround which is supplied as standard. The finish of the metal parts is of black bronze, but alternative finishes in polished brass, oxidised copper and oxidised silver are also available.

A Novel Fluid Meter.

The "Fluid" meter, an introduction of Messrs. Fluidmeters, Ltd., Winchester House, Victoria Square, Birmingham, is an ingenious instrument which provides, it is claimed, a simple, economical and efficient means of checking and registering fluids into and out of bulk storage; it is likely to interest generating engineers with Diesel plant. It is claimed to be accurate to within ¼ per cent. In a recent test made by the manufacturers, Messrs. Baker Perkins, Ltd., of Peterborough, 5,000 gallons were passed through a No. 5 "Fluidmeter" with a total error of 1 gallon. The "Fluidmeter" is robust in construction, simple in design, and efficient in operation. Its design prevents that clogging of valves which has so often proved fatal to measuring equipment. Its construction assures correct working under any climatic conditions. It functions with hot or cold liquids equally efficiently, and is constructed to withstand wear for a long period.

Single-wave Radio Broadcasting.

A consideration of the advantages to be derived from the operation of several radio-telephone broadcasting stations on one wave-length.

By CAPT. P. P. ECKERSLEY, M.I.E.E., and A. B. HOWE, M.Sc.

(*Extracts from a paper read before the* Wireless Section *of the* Institution of Electrical Engineers.)

THE number of wave-lengths available for broadcasting stations in any continental area is strictly limited, if their reception is to be free from interference, due to radiation from any aerial being composed, not only of rays parallel to, but also of rays at an angle to, the earth's surface. The latter radiation does not suffer attenuation as do the direct or ground rays. The indirect ray, travelling strongly until it strikes the upper electrified atmosphere, is bent again earthwards where its magnitude is comparable with the direct rays of other stations, even within their service areas. The geographical separation between stations, up to distances of 1,000 or 2,000 miles, makes little difference to the amount of mutual interference.

The best use of the available wave-lengths can be made in several ways, one of which is, first, to secure proper international agreement between nations as to the distribution of wave-lengths among all stations within 3,000 km of one another; secondly, to design the transmitting aerials of all stations so as to radiate, as far as possible, rays parallel to the earth's surface* and not at upward angles; thirdly, to use, in any territory, few high-power, instead of many low-power, transmitters; and, lastly, to share one wave-length between several stations, either in the same or in different countries.

The Union Internationale de Radiophonie is attempting to secure the required international agreement. It has been proved that something can be done to improve the service area for a given power by using very high transmitting aerials, which does not necessarily mean that interference with distant stations will be less. Most broadcasting authorities throughout the world are substituting for their present systems fewer stations of higher power (the British Broadcasting Corporation's regional scheme is largely based upon this principle). In 1924 Capt. P. P. Eckersley proposed, as a further method of attacking the limitation of the number of useful wave-lengths, the use of one wave-length for several stations. The original international plan for the allocation of wave-lengths to European countries was, on a suggestion by Capt. P. P. Eckersley, based on the use of "shared" or "common" wave-lengths. In 1925 the B.B.C. undertook experiments to find out the possibility of using one wave-length for several British stations (*i.e.*, the sharing of waves between stations in the same, in contradistinction to different, countries), and in consequence, during 1926, 1927 and 1928, four British relay stations shared one wave-length, and they were synchronised to an accuracy of 100-200 parts in a million. In 1926 and 1927, further experiments were undertaken to attempt to establish certain principles of single-wavelength working and, incidentally, to investigate methods of obtaining a practical system of very accurate synchronisation of carrier waves of stations. The result has been the conception of a scheme, begun in practice on January 13th, 1929, to share the one wave-length of 288.5 m between ten British low-power stations. In consequence of experiments, the German broadcasting authorities have decided immediately to work three of their stations on the same wave-length. American writers have forecast the solution of the problem of wave-length allocation for broadcasting stations by the use of single-wave-length working, *i.e.*, the working of several broadcasting stations on the same wave-length. As far as the authors are aware, two out of the 500 or 600 stations in the United States to-day repeat the same wave-length. Mr. Lemoine, head of the technical direction of Swedish broadcasting, has done a considerable amount of work on the subject and two Swedish stations exactly share the same wave-length.

The conclusion suggests that a part solution of the difficulty of giving satisfactory service to all listeners in a given continent, or nation, is the proper application of single-wavelength working, but it will be appreciated that many of the statements are based on theoretical calculations. The values of the indirect ray cannot be taken as exact, although they are remarkably confirmed by observations in two separate cases. The crucial experiment of single-wavelength working when the empirical factors for the relative field strength for good service conditions were determined, is wholly reliable. However, in general single-wavelength working is a practical proposition if means to carry it out can be found; even if there are large errors, shared waves between local low-power stations will be useful to cover large towns with good conditions of broadcasting if such towns happen to be outside the range of high-power regional stations.

Having outlined the theory of single-wavelength working in Section 1, Section 2 of the paper deals with the practical synchronisation of the stations involved. In general three methods as possible, as follows:—

(1) By arranging a continuous-wave transmitting station to emit a steady radiation of frequency f_d which is picked up at the broadcasting stations sharing a channel and is there multiplied n times to a frequency $nf_d = f_c$, the frequency of the wave to be used for single-wave working.

(2) By arranging a supply of sufficiently steady "low" frequency alternating-current, frequency f_l [which is $1/(n_l)$ of the frequency f], and distributing such currents by land line to the transmitters and, further, by connecting multipliers at the transmitters which multiply the low frequency f_l by n_l times until the required high frequency $f_c = f_l n_l$ results to drive the transmitters.

(3) By arranging for each of the transmitters "drives" which, although in no way interconnected, are so accurate and so carefully calibrated before installation that the desired measure of synchronisation is forthcoming without any common source of master frequency.

Variants of (1), (2) and (3) involve one, or two, or all, of these basic principles. Method (1) would involve a powerful long-wave transmitter (the more powerful the more scattered the broadcasting stations) and highly selective receivers at the stations.

Method (2) (interconnection by land line) is perfectly satisfactory; certain German stations use it, even using the land line for a control line (*i.e.*, for the passing of operating instructions, &c.) while the low frequency is passed over the same line.

Method (3) is merely a question of trying to find a frequency standard which can be maintained under ordinary engineering conditions to an accuracy which does not allow it to vary more than ten parts in 1½ millions, or one part in 150,000, but methods (1) and (2) both require some standard of frequency with a 1 in 100,000 order of accuracy, otherwise the frequency doublers will, particularly in the case of method (2), go out of adjustment; so the search for a highly accurate frequency standard is essential to all methods, if more vital in case (3). It is believed, however, that if precautions were taken an ordinary note oscillator would be sufficient for methods (1) and (2); we have two real alternatives for method (3), the tuning-fork and the crystal. While the interference situation in Britain was so serious, the B.B.C. in 1927 placed nine of its eleven relay stations and the Bournemouth main station on the same wave-length, thus basing its system on method (3) and a tuning-fork frequency standard.

From their recital of arguments and facts, the authors' conclude that single-wavelength working appears to be a practical proposition, albeit there are limitations to its application. Its chief sphere of usefulness would appear to be in bringing within first-class service area conditions the inhabitants of isolated towns outside the reach of high-power regional stations. There is thus a large sphere of usefulness for the national common wave. In Britain it bids fair to restore proper service to all relay stations which formerly were hopelessly jammed when working on international common waves. Further, even when regional stations are in operation, single-wavelength working may make for economy in the use of wave-lengths and still continue service to isolated towns not sufficiently covered by regional stations.

The scheme depends, of course, in large measure, upon land-line connections, and sometimes, in the lonelier parts of Europe, Australia, &c., the very towns that deserve, because of their density of population and their isolation, a broadcasting service, may be denied it owing to the lack of wire connection. The isolated tuning-fork, however, seems, when properly handled, to give the required measure of accuracy, and a wireless link might in some cases be used to cross the gap from programme centre to isolated transmitter. It is quite possible to use the same line for a master frequency to "drive" all transmitters simultaneously and also to modulate all such transmitters by the same programme. This would involve the use of a homogeneous air line, and a supersonic note would be superimposed over the programme. They sum up as follows:—

(1) If the fundamental radiation from two working broadcasting stations can be exactly synchronised and so held over a long period of time, then there will be around each station a service area in which good reception may be confidently expected (other things being equal), while outside such areas there will be a mush area in which good reception will be fortuitous and rare and where, in general, distorted reception will be manifest.

* Electrical Review, January 11th, 1929, p. 84.

(2) The service area of each of two stations sharing a wave will be determined by their relative power, the geographical distance of separation, whether night or day conditions prevail, the wave-length used, the accuracy of synchronisation, and whether the same or different programmes are radiated simultaneously.

(3) Given fixed stations of definite power, night conditions and given wave-lengths, the greatest factor determining the extent of resultant service area will be whether the stations radiate the same, or different, programmes; if the same programme is radiated the service area of each station will be vastly greater than if different programmes are transmitted from the given station.

(4) That, following on (3), it is useless on a continent to share wave-lengths between stations belonging to different nationalities, or groups; one nation, or authority, able to radiate one programme should place surplus stations on one wave called a "national common wave."

(5) That these stations should be, preferably, low-power stations serving densely populated towns, not too close together, and using a short wave, since the longer waves are too valuable for regional high-power stations to be used for this work.

(6) In the generality of cases in civilised countries, single-wavelength working should be a valuable means of bringing isolated towns into "A" service area conditions and should go a long way towards solving the vexed problem of the lack of available wave-lengths.

(7) That it is possible to use many stations on the same wave-length, and the interference with one station by all the others is much less than the sum of the field strengths of the others if their number exceeds five.

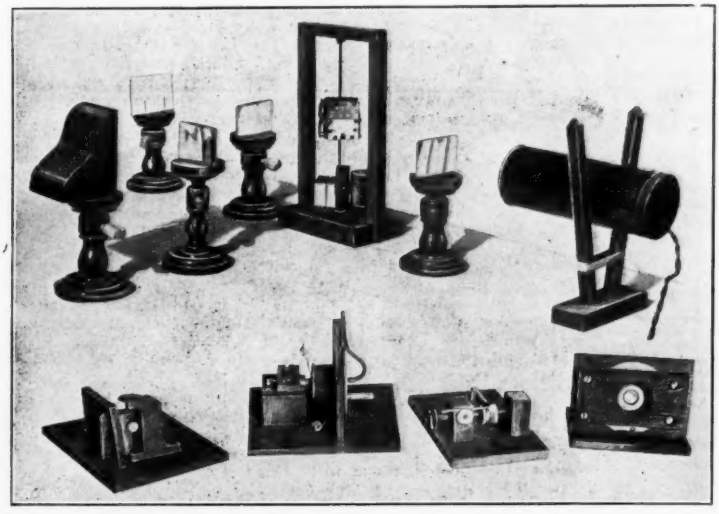
(8) There are, in general, two practical ways of synchronising the carrier waves of stations, (*a*) by separate valve-maintained tuning-forks, or oscillating crystals, forming the drive of the stations sharing a wave, and (*b*) by the distribution of a single low-frequency alternating current supplied from a reasonably constant source *via* ordinary land lines to the stations to share the same wave-length where, after multiplication, it is made to form the drive of the station; practical conditions must govern the choice between methods (*a*) and (*b*), but the service area will be slightly smaller with method (*a*) than with method (*b*).

Television.

A Brief Account of Recent Events.

IT was announced in the House of Commons on March 6th by the Postmaster-General that a demonstration of television took place on that day and was witnessed by a few members of Parliament of all parties, in addition to representatives of the British Broadcasting Corporation, the Baird Television Development Co., Ltd., the G.P.O., and others. It was necessary to restrict the number to a minimum, because at present the nature of the apparatus made it impossible for more than a few persons to witness the experiment simultaneously. The demonstration took place on the understanding that no information would be issued to the Press, but it is understood that transmission was from the London (2LO) station of the B.B.C., and that the receiving gear was located in the General Post Office.

Some apparatus made by himself was exhibited by Mr. Ll. B. Atkinson, by invitation, before the Television Society on March 5th. He recalled that in the *English Mechanic* of April 21st, 1882 (p. 151) have appeared a letter signed "W.L." in which he proposed the construction of what he termed a "telectroscope" for transmitting visible pictures electrically. The transmitter's single selenium cell was carried line by line across a picture, the current being thus varied to correspond with the light and dark shades; the receiver consisted of a mechanical arrangement. The space distribution of a light point was to be made by refracting the light beam horizontally and vertically through a pair of achromatic prisms, to correspond with the movement of the selenium cell, whilst the light had to be simultaneously varied by rotating one of a pair of Nichol polarising prisms by electromagnetic means, the motion being varied and controlled by the current variations in the selenium cell. He pointed out that the inertia of the Nichol prism arrangement would, in itself, be an overwhelming objection. He corresponded with another worker for over two years, giving advice and assistance in experiments he was making.



Some Early Models of Atkinson Television Apparatus.

Being then a student at Kings College, London, he devoted a good deal of attention to methods of analysing the image so as to present every point in turn to the sensitive selenium cell and the synthesis of a point light into an image, and also to methods of varying the light in the receiver to correspond with the selenium changes.

He was at the time working in the laboratory of King's College under Prof. Grylls Adams, who, in 1875-7, had carried out researches on selenium, and was acquainted with the technique of making cells (fine parallel brass and platinum wires on mica with selenium between and annealed). It was known that light from an interrupted source falling on such a cell would produce a musical note in a telephone, and so he assumed that at least telephonic frequency could be reached; for the receiving apparatus he therefore largely adopted the telephone as a model (his exhibits indicated various ways in which he hoped to produce optically the required light and dark changes: the upper part of the accompanying illustration shows an arrangement for projecting an image from revolving mirrors, while the lower part depicts telephone-type receiving devices). Amongst other methods tried was an attempt to utilise the Kerr effect, but he never was able to make the plane of polarisation rotate; he believed this was the method now adopted by Alexanderson. For the synchronisation of transmitter and receiver he proposed to use the Courphonic wheel. Although not suggesting that his exhibits were more than rough models, they nevertheless showed that 47 years ago methods of analysis and integration of an image had been worked out; the mirror method was, he believed, that used by Dr. Alexanderson with success. At that point he became immersed in active engineering work and had never since had time to take it up again.

In his presidential address nine years ago to the Institution of Electrical Engineers he referred to the problem, and ended by saying: "I am convinced, however, that all the elements for the purpose are now at hand, needing definite research to complete the task." That research had been going on vigorously in England, in America, and in Germany, but the use of the cathode tube, to which he attached great importance, still lagged, and there was thus much yet to be done.

Photo-telegraphy, tele-kinematography, television, &c., was the subject chosen by Mr. H. A. Hankey for his illustrated lecture before the Association of Supervising Electrical Engineers on March 5th.

Domestic Electrical Developments.

New Cooking, Heating, and Cleaning Devices for use in the Home.

A Screen Fire.

The "Redot" fire, fig. 1, a recent introduction of Lighting Trades, Ltd., 30-31, Farringdon Street, E.C.4, is constructed in the form of a screen, with a circular element in the centre. The body is made throughout of sheet-bronze, with a cast

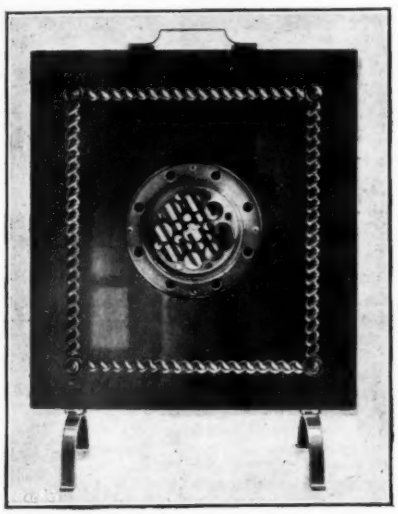


Fig. 1.—"Redot" Screen Fire.

ornamental surround of the same metal. It is a pattern which is likely to interest a large number of consumers of electricity, seeing that it serves a double purpose and can be used with advantage in dining and drawing rooms, lounges, and so on. The dimensions of the fire are 24-in. high by 18¼-in. wide, and it is fitted with two substantial metal feet and a metal carrying handle. A connection for the two-pin plug is provided at the back of the element, which is loaded at approximately 800 watts.

A New Heating System.

"Electro-Velocity" radiators, a recent development of Artic Fuse & Electrical Manufacturing Co., Ltd., Birtley,

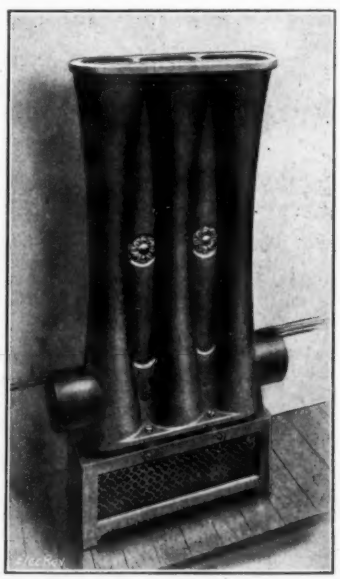


Fig. 2.—Three-nozzle "Electro-Velocity" Radiator.

Co. Durham, introduce a new system of electric heating, which, it is claimed, is, in effect, equal to central heating. The principle employed is really that of the convector. Cool air is drawn in at the bottom of the radiator and passes over electric heating elements, and heat is imparted to it. The warm air is then projected from the top of the radiator at a velocity of from 180 to 220 ft. per min. The velocity is automatically produced by the scientifically designed nozzles, and the circulation is equal, it is claimed, to that produced by a fan, without discomfort or draughts.

In addition to the main heat circulation by convection, a certain amount of heat is radiated from the surface of the apparatus. The elements are of nickel-chromium and, with their radiating fins, run at a black heat. The radiators are made for varying loadings from 500 W to 2,000 W, and are equipped with three or six nozzles, according to the loading. A 3-nozzle model is shown in fig. 2.

A Compact Cooker.

The "Redot" electric cooker, fig. 3, one of a range of such apparatus which has been introduced by Lighting Trades, Ltd., 30-31, Farringdon Street, E.C.4, embodies a number of features which make, it is claimed, for maximum efficiency. It is built round a heavily lagged sheet-steel case. The front of the cooker is of black-enamelled cast-iron, and

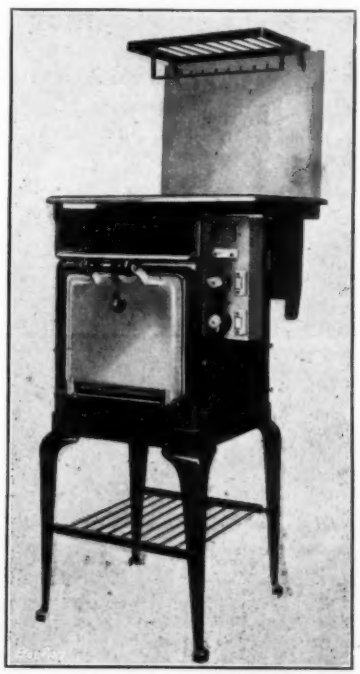


Fig. 3.—"Redot" Electric Cooker.

the apparatus is fitted with a polished bright steel top. The white enamelled door operates on a snap latch and spring hinges. The cooker is provided with a griller, simmering ring and boiling ring, and has a maximum loading of 5,000 W distributed in the following manner:—Griller, 1,000 W; simmering ring, 500 W; boiling ring, varying from 360 W (low heat) to 1,450 W (high); oven, 2,000 W (bottom heat 1,000 W and two sides 500 W each).

The grill and simmering ring are operated by snap switches. The boiling ring is controlled by a 3-heat rotary switch. The oven has also 3 heats provided in a similar manner.

Compactness of design has been closely observed in the construction of the "Redot" Cooker, the overall dimensions of which are 36-in. high (including 20-in. stand), 16-in. wide and 17- in. deep.

Three-heat Tailor's Irons.

During the last few months the demand for three-heat-control tailor's irons appears to have grown considerably, and the Electric Heating Co., George Street, Croydon, has been called upon to supply a number of such irons. Fig. 4 shows a 10-lb. "Elect" tailor's iron which is fitted with three-heat series-parallel control. The loadings are 200, 400 and 800

watts. The control equipment is carried in a special box near the handle, and the connecting lead is brought out at the side of the box and guarded at the exit by a special spring and

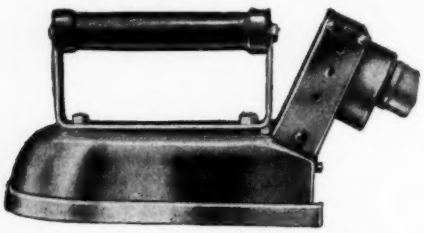


Fig. 4.—Three-heat Tailor's Iron.

insulation bush. A sliding panel is fitted in the switch box to provide easy access to the interior. The iron exterior is highly nickel plated and polished.

An Electric Egg Boiler.

The "Elect" egg boiler, fig. 5, recently introduced by the Electric Heating Co., George Street, Croydon, has been designed to meet the demand for a reliable egg boiler for hotels, tea rooms, and restaurants. The normal capacity of the boiler is eight eggs, but for a small additional cost a two-tier egg carrier can be supplied, bringing the total capacity

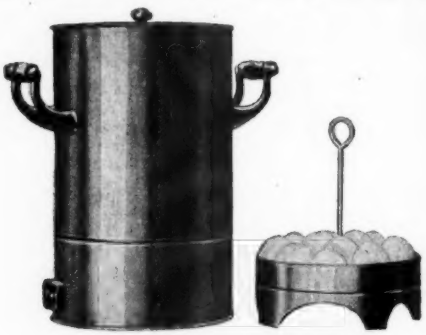


Fig. 5.—"Elect" Egg Boiler.

up to 16. The boiler is constructed of stout copper, highly polished to reduce radiation losses as far as possible, and the loading is 1,000 watts.

The Ideal Home Exhibition.—II.

A Review of the Electrical Features.

THAT the display and demonstration of electrical apparatus at popular exhibitions does good work in at least creating public interest in domestic electrical service was evident during the second week of the Ideal Home Exhibition. During the "rush hours" it was not easy to make a call at some of the "electrical" stands. On the whole the manufacturers and others who are displaying electrical equipment are to be congratulated on the success of their shows, especially those who are so efficiently carrying out demonstration programmes.

Generally, the lighting of the exhibition shows a considerable advance, and it is particularly encouraging to note the

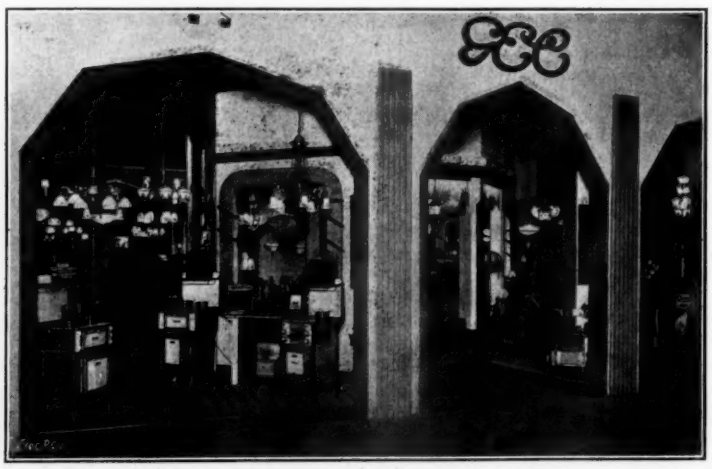


Fig. 1.—One of the All-Electrical Stands.

adoption of modern electric lighting methods and fittings, both for sale and for the lighting of their stands, by many of the general exhibitors.

Among a number of "non-electric" firms which are showing attractive and novel electric lighting fittings are Messrs. Louis Dernier & Hamlyn, Ltd., who have displayed "Litlux" and "Neolux" fittings. The former are made of silk, nacrolaque, parchment, and so on, screening the light and giving a diffused and golden glow, and the latter are made of glass panels with metal mountings, the panels being delicately colour tinted and designed in simple and clear-cut floral and geometrical form.

The General Electric Co., Ltd., has a very attractive and imposing display, the stand taking the form of a kiosk, fig. 1, so arranged that from whatever angle it is seen a clear view to the back of the stand is provided. The range of electrical appliances and accessories shown covers every household requirement, and demonstrations are being given with appliances in a model kitchen and scullery. Among the apparatus displayed is a series of electric cookers which are all fitted with easily-accessible elements and totally-enclosed quick-boiling plates.

A new "Magnet" wash boiler shown works on the thermo-siphon principle, the water being kept in constant circulation without the use of mechanism other than the special percolator. Also displayed on this stand are a number of "Magnet Cosy-glow" electric fires. In addition to two-panel elements on the front of each of these fires, the heat projected from them is supplemented by a Robertson-type flame-colour lamp affixed behind the elements, the glow from the lamp being reflected by a hammered-copper reflector. An automatic cut-out kettle is another feature. This has a simple device which cuts off the current before the kettle bottom becomes overheated; the device can be easily reset to allow the kettle to be used again. There is also an improved form of the popular "Magnet" vacuum cleaner, a revolving type of ironer, two new patterns of water heaters and urns, and an ingenious washing machine, the "Pixie," fig. 2, which does dish washing, it is claimed, with freedom from crockery breakage. The A.S. automatic refrigerating machine is another exhibit which is attracting attention.

Fig. 2.—The "Pixie" Washing Machine.

The company is also displaying ranges of electric-light fittings, fixtures and lamps, including a series of high-grade modern-type pressed and moulded glassware pendants incorporating wrought metalwork. A feature on the stand is a "photo-electric cell" arrangement by means of which the number of visitors to the stand is automatically counted; each visitor entering the stand breaks a beam of light projected on to the cell, and thereby operates a relay which, in turn, operates counting apparatus.

Another large stand devoted to household electrical appliances of all kinds is that of Messrs. L. G. Hawkins & Co., Ltd. Prominence is given to the "Universal" electric wash-

Fig. 3.—"Universal" Washer and Wringer.

ing and drying machine, which comprises an agitator-type washer and centrifugal dryer or hydro-extractor, the latter taking the place of the usual wringer. It will damp-dry goods, it is claimed, from blankets to delicate fabrics ready for ironing. A small electrically-driven pump is provided for draining off the water from the washer. The "Universal" combined electric washer and wringer, fig. 3, is also shown, together with examples of the "Coffield" electric sheet and table-cloth ironing machine, and the new "Universal" electric hand irons, the latter being each fitted with an automatic device which switches off the current when the iron is not in actual use. Part of the Hawkins stand is set out as a model electric kitchen, the equipment including automatic electric cookers, washing and drying machines, and so on.

Reliance Telephone Co., Ltd., is giving demonstrations of the Reliance automatic exchange telephone system, which is independent of the P.O. service, and is intended for internal communication in offices, clubs, hotels, and so on. The G.E.C. automatic private exchange telephone systems are also represented on this stand by 25-line and 50-line units. Also shown is a number of useful telephone accessories, including a range of "Magnet" extending arms, hygienic glass mouthpieces, phonopads, and so on.

Vampires, Ltd., is specialising on electrically-operated vacuum-cleaning machines, among which are the "Hobby," "Dandy," and "Vampire." The first-named is the popular household type, which is fitted with a 1/10th-h.p. motor; it weighs 18 lb. and is claimed to be capable of cleaning an area of 500 sq. ft. per hour on a minimum consumption of current. The "Dandy" cleaners are made in three sizes with motors of respectively ¼, ½, and 2/5th h.p., with correspondingly higher capacities. All the machines are supplied with interchangeable brushes for floor waxing and polishing.

Kelvinator, Ltd., is showing five different sizes of refrigerating cabinets, ranging in actual food-storage capacity from 5 to 12 cu. ft. A cold room of 150 cu. ft. storage capacity, suitable for large country houses, hotels, and so on, is also shown on this stand.

The Sloan Electrical Co., Ltd., is demonstrating the "locomotive" electric washing machine. The action of this machine produces a "loop the loop" action which forces the suds through the clothes. Several auxiliary devices to this machine include the "Safety" wringer, the upper roller of which is automatically raised upon being unduly loaded with clothes.

Popular models of the "Bulle" electric clock are displayed on the stand of Messrs. Bulle Clock. It is claimed that the clock will run on one small dry battery without attention for two or three years.

Combustions, Ltd., is showing the "Automestic" oil heater, an apparatus for fuelling domestic boilers. An oil jet is trained into the furnace by means of an electrically-driven compressor; electric ignition is provided, and the apparatus is automatically and electrically controlled.

The Delco-Light Department of Frigidaire, Ltd., is showing a selection of automatic and semi-automatic electric lighting plants. In a fully-automatic model a battery takes care of the load up to 300 W, but above that load the plant automatically starts, and stops when the consumption is reduced to 175 W.

A self-contained electric lighting plant is also being displayed by Messrs. Thorn & Hoddle, Ltd., who feature the "Pelapone" and other automatic sets. "Aquarius" and "Good-Egg" electrically-driven pumps are also being shown.

Kohler Co., Ltd., has installed a 1,500-W and an 800-W automatic sets working in connection with the "Georgian" house in the village of "Welcome In."

The Dowsing Radiant Heat Co., Ltd., is showing a wide variety of electric heating and electro-medical apparatus, including "Solarium" radiant sun-bath apparatus.

A special range of "Daylight" reading lamps is being shown by Sheringham Daylight Co., which is demonstrating by the usual cubicle method the changing of ordinary electric light into "Daylight."

Electrolux, Ltd., has its usual display of "Electrolux" refrigerators, cleaners, polishers, and so on, and Frigidaire, Ltd., have on show a wide and attractive range of Frigidaire automatic electrical refrigerators.

Electro Rays, Ltd., is showing several recent "Astro" specialities, including "Ideal" reading lamps, high-frequency generators, home-type artificial sun-light apparatus, and so on.

Electrical domestic labour-saving appliances of all descriptions are to be seen on the stand of Hotpoint Electric Appliance Co., Ltd., and demonstrations are being given of the "Hotpoint Maytag" clothes-washing and wringing machine and the "Hotpoint-Utenco" electric ironing machine. It is interesting to note that the "Premier-Duplex" and the "Premier-Junior" electric vacuum cleaners are now both fitted with polishing attachments.

Cookery demonstrations are being given daily on the stand of Jackson Electric Stove Co., Ltd., the apparatus used being, *inter alia*, the "Jackson Junior" cooker and the new "Jackson" table cooking cabinet. Water-heating equipment is also being shown by this company, as is also the "Jackson Atom" fire.

Oatway electric hot-water radiators, examples of which are to be seen on the stand of Oatway Safety Heating Co., Ltd., are available in sizes from 250 to 3,000 W.

Marco Refrigerators, Ltd., has displayed a range of cabinets, some of which are particularly attractive, and finished in white or oak.

Berry's Electric (1928), Ltd., has a very attractively set out stand, showing the latest models of "Magicoal" fires, Berry-McClary cookers, and so on. A feature of this exhibit

Fig. 4.—"Louis Lattice Magicoal" Fire.

is the "Louis Lattice" model of "Magicoal" fire, fig. 4, which has a standard "Magicoal"-fire effect, with flame, and is loaded at 3 kW. It is claimed to be rust-proof throughout, and is equipped with gilt enrichments, according to the period of the design.

A new vacuum cleaner, the new "Super Eureka," is being shown by the Electric Appliance Co., Ltd. This apparatus has an adaptation for motor-car cleaning, a "Sanatizer," by which carpets can be floated on a cushion of disinfecting gas, and a moth-control method for fabrics of all descriptions.

"P.H." Electric Warm Air Convectors are showing examples of apparatus of the same name, which take the form of small electric convectors embodied in articles of furniture, such as umbrella stands, and so on.

A comprehensive display of lamps may be seen on the stand of Philips Lamps, Ltd., which attractively features the "Argenta" opal lamp as "the ideal lamp for the ideal home." Special attention is given to "Daylight Blue," "Duplo" anti-dazzle automobile, and "Duo-Savelite" lamps.

Revo Electric Co., Ltd., is showing a variety of much apparatus as cookers, washboilers, fires, and so on. A feature of the apparatus is an automatic kettle, which has a simple push-button resetting device and no fuses.

A reminder that the housewife's daily ally and friend in the matter of saving time, worry and expense in the telephone, is being given by the Telephone Development Association, which is demonstrating modern telephone service. This stand is the headquarters of the Telephone Growth Competition.

Models of the "Tellus" electric vacuum cleaner are being shown by the Tellus Super Vacuum Cleaner Co., Ltd., and "Thor" models are on show by Thor Electric Servants. The latter company has some special models with illuminated interiors.

Steam Power Plant.

A survey of modern practice, with particular reference to pulverised-coal-fired boilers and operating cost.

By F. W. NICHOLLS, A.M.I.E.E.

(*Extracts from a paper read before the* London Local Technical Group *of the* Electrical Power Engineers' Association.)

ANY success which we have established at Derby has been gained through a prompt recognition of our difficulties and overcoming them by engineering methods. The present paper covers a period of nearly three years during which our progress has continued upon scientific lines of development, the success of which promises to have a far-reaching effect upon boiler design in this country and other parts of the world.

The plant installed at Derby in 1925, one of the first of the "Lopulco" powdered-fuel installations in this country, comprises two Babcock & Wilcox boilers working at 300-lb. pressure per sq. in. and has continued to uphold every claim originally made for reliability, efficient performance, and extreme flexibility in operation; whilst experience has dictated certain improvements which have been included in later units, the original plant is our first favourite and continues to give most efficient service.

The first extension comprises one unit built to the original specification and operating at the same pressure, but embodying water-cooled tubes in the combustion chamber brickwork. It was put into service early in 1928 and the water cooling of the combustion chambers with solid-walls has been of real value. We operate with a higher CO_2 content of the gases without injuring the combustion chamber brickwork regularly. Slightly higher operating efficiencies have been obtained and our maintenance costs for furnace repairs are in for a considerable reduction on account of the protection which the water-tube lining affords to the brickwork, without interference in any way with the process of combustion in the furnace.

During the first year the coal consumed was 25,000 tons and the total cost of renewals was £836 6s. 9d., or 8.02d. per ton. During the second year the coal consumed was 24,000 tons and the total cost of renewals was £950 11s. 6d., or 9.2d. per ton. The increased cost of maintenance is accounted for by the cost of upkeep of the air-cooled combustion chambers and the systematic programme of changing parts of the plant. The effects of embodying the water-cooled features have been so clearly demonstrated in our new unit that it is permissible to suggest that these costs are more likely to recede in future operations. The average operating costs of the Derby plant are:—

Labour cost of—	
Drying, pulverising, exhausting to cyclone and conveying to pulverised-fuel bin	6.1d. per ton
Boiler operation, *i.e.*, boiler attendant	3.6d. ,, ,,
Ashing, cleaning of plant, &c.	3.08d. ,, ,,
Power for operating dryer, pulveriser, exhauster, conveyor and feeders— 23 kWh per ton at 0.25d. per kWh ...	5.75d. ,, ,,
Or a total of	18.53d. ,, ,,

Or slightly over 1s. 6½d. per ton.

Therefore, neglecting depreciation charges, the complete cost of all repairs throughout the boiler plant, power consumption in operation, attendance and cleaning is:—

Repairs and maintenance	9.20d. per ton
Operating	18.53d. ,, ,,
Total cost	27.75d. ,, ,,

These figures will indicate why we have been able to return a coal cost per kWh generated of 0.15d. throughout the whole of last year's operation, being one of the lowest in the whole of Great Britain.

Trouble connected with the formation of slag in the combustion chamber was overcome by the introduction of the patented water screen. The next stage in progress saw the water screen linked up as an integral part of the boiler circulation, which was followed by the introduction of headers to feed the tubes serving to cool the walls of the combustion chamber. Those modifications increased the heat liberation per cubic foot of combustion chamber, and decreased the dimensions of the combustion chamber, from which has followed the conception of the radiant-heat steam generator, first constructed in this country in 1924 and subsequently modified and brought to its present stage. It has been operating in a large engineering works in Manchester since the early part of 1925; the actual tubes are all arranged in such a manner as to form a completely water-cooled combustion chamber, and the plant regularly supplies the steam required throughout the works and has replaced a battery of eight water-tube boilers. The principal features are the distribution of the heating surface, following the realisation that the primary function of any steam generator is that of a heat-reclaiming plant. Therefore, the parts which are subjected to the pressure, which must be of robust design and to insurance standards, have been arranged to take advantage of the maximum heat transfer through radiation. Owing to its unique form of construction, there being no brickwork at all in the combustion chamber, a very large air preheater is incorporated which permits of a high degree of heat transfer from the gases and enables the combustion air to be preheated to temperatures averaging from 450 to 500 deg. F. A later installation embodying several minor changes in design has since been put in operation at the Brighton electricity works, whilst in America over 16 installations are in successful operation; the latest installation is to operate at a pressure of 1,850 lb. per square inch.

The plant being constructed for the Derby Corporation undertaking consists of two steam generators with a normal evaporation of 80,000 lb. of steam per hour, and will be ready for service for next winter's load. The working pressure will be 300 lb. per square inch and air preheating is being introduced for the first time on the Derby plant.

The original installation comprised hollow air-cooled side walls; when operating with a high CO_2 content, which is so easy to attain with this method of firing, the brickwork is liable to severe expansion strains, resulting in a tendency to break away from the holding tiles. A modification of the method of bonding was adopted for one boiler in 1927 and for the other in 1928, as noted in the maintenance costs. When operating with a high CO_2 content and using fuels with a low fusing ash point slagging was experienced, and if allowed to continue rapid erosion of the brickwork would have resulted; to obviate troubles in this direction the CO_2 content is restricted to from 12 to 13 per cent.

The boiler which commenced steaming in 1928 was equipped with a Murray fin-tube wall on the back and 16 tubes spaced at 14 in. centres on both side walls, the front wall being of hollow brick construction, a CO_2 content of from 14 to 15 per cent. being maintained without slag formation, with varying qualities of fuel, the cooler furnace in the vicinity of the side wall allowing of this, in addition to the support afforded to the brickwork.

The success of p.f. firing centres on efficient drying of the fuel to at least as low as 2 per cent. surface moisture (if possible, lower than that) at a temperature as closely approximating boiler-room temperature as is possible, as an aid to efficient transport and combustion. There is a tendency to decry the dryer as a nuisance and to eliminate it by increasing the capacity of the elements adversely effected by moist fuel. Raising the coal to a high temperature to effect drying does not obtain the desired purpose so readily as an air current passing through the fuel in a state of agitation, such as would obtain by passing air at high temperature through the transport lines with the fuel, after pulverisation has been

effected. By this means also, condensation troubles would be avoided when fuel is passing through the system at a temperature higher than that of the surrounding atmosphere. Whilst transport and feeder systems give little trouble when the fuel and surroundings are at an even temperature with 6 to 8 per cent. surface moisture, the effect upon combustion renders it desirable to reduce to at least 2 per cent. the surface moisture.

The Raymond mill has proved itself to be a very efficient machine. Developments are in the direction of larger mills in order to reduce the power consumption per ton milled, whilst later designs of the "ring roller mill" offer certain improved mechanical advantages.

Discussion in London.

Mr. H. C. Mount pointed out that some of the author's costs were incurred two years ago, and in view of improvements effected in the design of plant produced to-day the cost of maintenance of new plant would be very much less than was indicated by the author's figures. He indicated items which could be eliminated, or reduced, and arrived at a total maintenance cost of £452, instead of the author's figure of £950. The cost per ton of coal consumed in 1927-28, therefore, would be 4.5d. instead of the author's figure of 9.2d.

Mr. E. F. Hall said few who had had anything to do with powdered fuel were so optimistic as Mr. Mount; in fact, they felt inclined to envy Mr. Nicholls his results, and did not hope to be able to halve their maintenance costs yet. In modern systems, in which drying was effected by means of hot air, or hot gas, and with the varying fuels they were forced to burn in these islands (which would not even be looked at in America) surface moisture should be regarded from the point of view of total moisture. It was misleading to talk of surface moisture when there might be present 8 or 9 per cent. of hygroscopic moisture; it not only accentuated slagging trouble, but led to the greater trouble of "bird-nesting" when the rate of combustion was raised very much. Various methods were being proposed by plant manufacturers to overcome that difficulty.

Mr. Percy Rycroft expressed the opinion that the plant at Derby was one of the best examples in this country. With regard to the maintenance costs, he regretted that Mr. Nicholls had not set out the figures for the first and second years of operation in exactly the same way. Tests carried out by an independent engineer on the original plant indicated a boiler efficiency of 83 or 84 per cent., but those were not high figures. When considering the coal cost of 0.15d. per kWh generated at Derby it must be borne in mind that the cost per ton at which the fuel could be obtained at Derby was extremely low, and in order to arrive at the cost of generation by similar means at other places one must have some knowledge of the cost of coal there. What Mr. Nicholls had proved was that in the case of fuel which it was difficult to burn by other means pulverising offered appreciable advantages.

Mr. E. N. Taylor said probably all would agree that by firing coal in the pulverised form they were able to obtain better combustion than by firing it in any other form. Mr. Nicholls gave one the impression that he was a firm believer in the complete water-cooling of a furnace, but he (Mr. Taylor) could not see how a furnace so completely cooled as Mr. Nicholls proposed it should be would attain to the furnace temperature which was necessary to give good conditions of combustion. From that point of view the completely water-cooled furnace was discounted, although it had its advantages from the point of view of refractory maintenance. With regard to the statement that on the side walls of one boiler the tubes were spaced at 14-inch centres, he said he did not consider that method of bare-tube cooling was correct.

Mr. R. H. Gummer said that the success of any installation depended to a large extent upon the skill of the operators. He admitted quite freely that the dust problem was a very prominent one in connection with pulverised-fuel-fired installations, but the difficulties had been exaggerated. At Derby an efficiency of 86 per cent. had been attained with ordinary dust-collecting apparatus, quite apart from the water sprays in the stacks, which had an efficiency of upwards of 90 per cent.

Mr. A. W. Nunn asked a number of questions.

Mr. Thomas said there was an essential difference between the bin-and-feeder and the direct systems. There was a possibility of the grinding in the latter case being less perfect than that carried out in low-speed mills; therefore, the particles of coal entering the furnace were likely to be larger and, if combustion were not complete and air distribution were not thorough, there might result a certain amount of stratification, a drop in velocity, and ultimately "bird nesting." Therefore, it seemed that the fineness of pulverising was of very great importance.

Mr. Hall agreed that the system adopted was the direct one, but, so far as an extended series of investigations had shown, fineness of grinding had nothing to do with the trouble. He had had coal ground very coarsely by speeding up the exhauster fan on the bin-and-feeder system, and had not obtained quite the same results. He and his colleagues had found that the difficulty was bound up more with the ash fusion temperature and moisture content at the moment the coal entered the furnace; the exact relationship, however, they had not yet been able to find.

Mr. Stretton said he had been assured recently by the operating engineer at a large works where pulverised fuel was adopted that exactly the same trouble as was referred to by Mr. Hall was experienced there with a centrally-fired system. Apparently, therefore, fineness of grinding had nothing to do with it. In spite of the reputed cleanliness of the pulverised-fuel system, the operating engineer was somewhat black, and he appeared also to be somewhat heated, in spite of the reputed ease of operation of the system. Was Mr. Nicholls a very lucky man, or were the difficulties experienced by others exceptional?

Mr. Lowden said that there was a lot of talk about the thermal efficiency of pulverised-fuel-fired plant, but one never heard anything about its commercial efficiency. A thermal efficiency of 83.5 per cent. was not bad (attained at Derby), but he was able to obtain that efficiency also with mechanically-stoked plant. Maintenance costs equal to 9.2d. per ton of coal burned and operating costs of over 1s. 6d. per ton were rather high; 1s. 6d. per ton represented a very big percentage of the value of the coal, and the operating cost of plant used before pulverised fuel came into use was considerably lower than that; mechanical stoker operating costs were practically nil. If one added 1s. 6d. per ton to the value of the coal used at Derby, the 80 per cent. efficiency which Mr. Nicholls had claimed for his plant must be reduced to about 70 per cent. He had been examining tenders for the provision of plant with mechanical stoking and pulverised-fuel firing, of similar capacity, and in the majority of cases the capital cost of the pulverised-fuel-fired plant, everything included, was from 50 to 75 per cent. higher. Furthermore, the extra capital cost did not compare with the extra cost of operation and maintenance of the pulverised-fuel plant over the mechanically-stoked plant, as certain coals were burned on mechanical stokers which could not be used for a pulverised-fuel-fired boiler; those coals, of course, were cheap. Coal delivered at 9s. 6d. per ton in London was used at the L.C.C. power station at Greenwich; it was water-borne.

Mr. Mount doubted very much whether Mr. Lowden would find by examining the contracts placed during the last three, four, or five years, that in any one case the capital cost of pulverised-fuel installations was more than 20 per cent. higher than that of installations fired by mechanical stokers. In the case of boilers with evaporative capacities of 10,000, 20,000, or 30,000 lb. per hour the capital cost, if fired by pulverised fuel, would be greater than if fired by mechanical stokers, but the capital costs for capacities of 80,000 and 100,000 lb. per hour were comparable. As the size of plant increased, powdered-fuel installations were in the more favourable position, taking into consideration the buildings, space occupied, and the capital cost of the ground; it was not quite fair to compare the boiler installations themselves, apart from the buildings in which they were to be housed.

Mr. Lowden said the boilers he had referred to had an evaporative capacity of 100,000 lb. per hour.

Mr. Nicholls, replying to the discussion, said he had never found the hydrogen content of British coals was much more than 4 per cent.; 3.5 or 4 was the usual percentage of hygroscopic moisture in the coals used in the Midlands, and it had very little ill-effect on pulverising. "Bird-nesting" had been experienced, due to the use of fuels with a low fusion ash point. Yorkshire and Derbyshire coals had invariably a low fusion ash point, in the neighbourhood of 2,100 deg. F., and they would fuse at 13 per cent. CO_2, which was equivalent to a furnace temperature of about 2,300 deg. F., and give trouble. When the trouble occurred soot blowers were used, and the method adopted with a view to preventing its occurrence was to allow a certain infiltration of air at the bottom of the chamber, which would creep up the side walls and tend to keep the furnace temperature within limits and restrict the CO_2. One could light up in about 30 seconds by means of a torch, and could apply full-load conditions in 30 seconds and obtain a CO_2 content in the flue gases of 14 or 15 per cent., which was convincing proof that combustion was self-supporting and no refractory was required. He was quite convinced that the dust problem need never worry anybody who desired to install pulverised-fuel plant. His figure of 1s. 6d. per ton included all costs, and he could not see how one could operate a stoker plant for nothing. If the capital cost of pulverised-fuel plant were 75 per cent. more than that of stoker plant, the former would never have been installed at Derby. One could burn any coal on a mechanical stoker "after a fashion," but one could burn any coal in pulverised-fuel plant properly and obtain the highest efficiency. The cost of the coal pulverised at Derby was about 30 per cent. cheaper than that used for stoker firing.

Legal.

Fraudulent Electricity Consumption Charge Dismissed.

The Times reports that a summons alleging that Mr. Reginald Algernon Glindon, dentist, Worple Road, Wimbledon, had fraudulently used electricity at his premises was dismissed by the Wimbledon magistrates on March 6th. The chairman, in announcing the decision of the Bench, said that Mr. Glindon left the Court without any imputation or stain upon his character as a result of the proceedings. The magistrates desired him to say that in their opinion greater care ought to be taken in the preparation of such cases. Mr. Frank Powell, defending, applied for costs, but the chairman said that the Bench did not feel justified in allowing costs. It was alleged for the prosecution that at Glindon's house a standard lamp

had been attached to the power wiring so that current for lighting was obtained at the power rate of 1d. per kWh. Mr. Glindon denied the charge, stating that a maid put a lighting point out of action by connecting up a vacuum cleaner to it instead of using the power plug. He therefore connected the light to the power plug until the light could be put right.

Glasgow Electricity Department's Accounts.

Sheriff Macdiarmid, on March 6th, issued his decision on a point that arose in the action referring to the Corporation electricity department's accounts, in which a ratepayer asked the Court to order the Corporation to lodge in Court full details of certain items referring to rent, rates, and taxes (£189,058); management expenses £12,644); and outstanding revenue assets (£29,769). The Sheriff has ordered the Corporation within 14 days from March 5th to lodge in process full details of all the items objected to. He continued the case till March 21st and granted leave to appeal.

British Thomson-Houston Co., Ltd., v. Uneedus Electrical Service.

This action came before Mr. Justice Eve, in the Chancery Division on March 8th, on a motion by the plaintiffs for an injunction to restrain infringement of their letters patent. Counsel said defendants were W. R. Bradley and his son, who were partners in the business.

Mr. Bradley, who appeared in person, was asked by his Lordship how he came to infringe the patents. Defendant said he had been going round with his son selling a few lamps which he had got from a man whom he did not know.

His Lordship said that the object of the action was to find out where the lamps came from. They might have been stolen goods.

Counsel asked for an injunction and an inquiry as to damages, and his Lordship made an order to that effect, and said that defendant must pay the costs.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Climate and Overhead Lines.

I was very interested in the report in your issue of January 25th of the Overhead Lines Association meeting at which Mr. G. W. Molle read a paper on the above subject, the main conclusion of which was that a 50-mile wind never coincides with ice accumulation on a wire and 10 degrees of frost; that consequently the Electricity Commissioners Regulations have a wrong basis, and that wind pressure and temperature should be the only considerations.

Mr. Molle appears to have made a thorough search through meteorological statistics, but I think he may have missed the devastating storm of March 27th, 1916, when so much havoc was done to the overhead telegraph and telephone lines of the Post Office and the railway companies. I have not the exact figures by me, but certainly in that case a wind greater than 50 miles an hour coincided with accumulations of over 2 inches of frozen snow on the wires. In the case of the Post Office alone 2,150 poles were broken, 6,050 were uprooted, and 33,300 were blown down, a total of 41,500 poles and 17,000 miles of wire broken. The railway telegraphs were similarly affected. The storm extended from the Humber to Pembroke and from the Wash to the Bristol Channel. Telegraph wires may be brought down by a silver frost, or by the accumulation of damp snow, subsequently freezing, and followed by a gale. In the first case descending rain freezes on the wire, accumulates, and forms a tube of transparent ice, which may break the wire even if there is no wind. In the case of frozen snow, light lines may be brought down, but not the heavier wires unless a strong wind follows the accumulation of the snow. In that particular storm the snow, or rain, was driven against the wire, where it froze hard on the windward side of it in a horizontal band of ice of little more thickness than the wire, but some 2 in. in width. Slabs of ice were formed from top to bottom of the poles on the windward side several inches thick and approximately of the width of the pole, where it was in contact with the pole, and tapering down towards the N.E. That great accumulation of solid ice, coupled with the very high and cyclonic wind, wrought the havoc referred to above. Storms of equal severity have occurred at about 10-year intervals and extensive breakdowns of communication circuits have always been associated as a combined effect of ice loading and wind.

It was stated in the paper that snow and ice accumulate on communication lines, but not on power lines, and, of course, if that is correct then the basis of the Electricity Commissioners Regulations is obviously wrong. There were few overhead power lines erected in the path of the 1916 storm and no comparison can be made of their behaviour with communication lines, but surely it should be easy to verify the contention now that overhead power lines are so common. If snow and ice do not adhere to power wires in this country Providence must be specially considerate to us, as they undoubtedly do in the U.S.A., where extensive breakdowns of overhead power lines occur periodically when there is a combination of sleet with high winds. As you are no doubt aware, Sir, the Safety Regulations of the U.S.A. are practically the same as in this country, *viz.*, ice loading, wind, and temperature. There are, however, classes depending upon assumed weather conditions. In the heavier loading districts allowance has to be made for ½ in. of ice, an 8-lb. wind, and a temperature of 0 deg. F. In medium loading districts the ice figure is reduced to ¼ in., the wind is 8 lb., and the temperature 15 deg. F. In the light loading districts no ice, a 12 lb. wind, and 30 deg. F. are reckoned. In several European countries and Japan ice loading and wind have to be allowed for when calculating the factors of safety under the regulations in force, but in many cases there is the alternative of a higher wind and temperature, the most unfavourable applying. Under the old Board of Trade Regulations no allowance was made for ice load, the calculations having to be made on the assumed wind pressure of 25 lb. per sq. ft. on 0.6 of projected area. I was surprised to find that during the discussion no one called attention to the point that where ice loading is *not* taken into account in the calculations, and ice in fact *does* accumulate on the wires, if light gauge wires are erected with a proper factor of safety then the larger gauges of wire will have an unnecessarily high factor of safety; whilst, if the large gauges have a reasonable factor of safety, then the smaller gauges will be unsafe. It was undoubtedly these considerations that decided the Commissioners to throw over the old Board of Trade Regulations based on a very high wind and temperature, for those based on a much lower wind velocity, combined with ice and temperature allowances. However that may be, if it is a fact that ice and snow do not adhere to power lines this point has no significance.

I have no knowledge as to this, but I see frequent references to short-circuits on power-lines being caused by accumulations of snow falling from one-phase wire, which then springs up and touches or becomes entangled in the others on which the snow has remained. It is an important matter, as any relaxation of the regulations in this respect might lead to widespread destruction of lines when a storm like that of March, 1916, occurs again, as undoubtedly it will.

S.C.B.

March 3rd, 1929.

Ex-Siemens Men.

The undersigned have had inquiries from time to time whether there is an organisation where ex-Siemens men can foregather, and it appears that such an organisation would meet the wishes of many.

We are, therefore, seeking the courtesy of your columns to invite those who have been connected with any of the Siemens concerns in the past, both at home and overseas, to communicate with one of the undersigned.

If there is sufficient response, it is proposed to form a small committee to arrange, in the first instance, a reunion.

J. Snow Huddleston,

Union Cable Co., Ltd.,
Dagenham.

E. P. Barfield,

Wild-Barfield Electric Furnaces, Ltd.,
Elecfurn Works, North Road, Holloway, N.7.

March 11th, 1929.

London Trunk Power Cables.

The correspondence under the above heading in your recent issues has been of natural interest to us, inasmuch as we specialise in the protection of all classes of buried cables.

Mr. K. Bell suggests that, rather than protect 66,000-volt cables with either reinforced-concrete slabs, or wooden covers, as an alternative, presumably for greater protection, such cables should be drawn into ducts. We must agree with your correspondent who signs himself "Resident Engineer" that such a method increases considerably the number of joints (always weak spots in a cable line), but we are also desirous of emphasising that, owing to their limited thickness and brittle nature, ducts offer considerably less resistance to a blow from any excavating implement than any other approved method of cable protection.

"Resident Engineer" states that "the usual method of covering cables for protection with concrete covers marked 'Electricity' appears to be quite satisfactory, but I do not favour the wooden protective covering." We are glad to be again in agreement with him regarding protection with wooden covers, which deteriorate rapidly, no matter how well creosoted, and ultimately completely fail to serve their purpose. We are, however, in fairness to ourselves, compelled to object strongly to his statement that the usual method of covering cables is by concrete covers, and consider we can justly claim that the usual method of covering e.h.p. cables is with our special interlocking tiles stamped "Danger Electricity." We base this claim on the fact that we supply these to approximately 75 per cent. of the leading electricity undertakings in the British Isles, and also ship large quantities for important contracts abroad.

Our interlocking tiles will not deteriorate in any soil, as will boards, no matter how well creosoted; also, they set up no adverse chemical action, as some concrete has been known to do. Our interlocking device makes lateral displacement impossible. Finally, in comparison with either boards or concrete, our tiles have the distinct advantages of being 100 per cent. British and cheaper.

H. J. Baldwin & Co.

Cheapside, Nottingham, *March 8th*, 1929.

Prepayment Meters.

The relations between the consumer and the undertaking with regard to prepayment meters depend entirely on the terms of the agreement signed by the consumer.

The insertion of the following clauses in the agreement for supply appears to be adequate protection :—

Consumer Responsible for Damage.—The consumer shall be responsible for the due care and safe custody of the meter, main fuses, and other property of the Council, and in case of loss or damage by fire, or in any other manner, shall make good such loss or damage. He shall also be responsible for any electrical energy consumed on his premises, until three days' written notice is received from him requiring the supply to be discontinued, notwithstanding that he may in the meantime have ceased to occupy such premises. Subject to the general provisions with reference to meters contained in the foregoing terms and conditions for the supply of electricity, the record of the meter shall be conclusive evidence of the amount of electricity supplied.

Prepayment Meters.—Where prepayment meters are fixed, payment shall be made by the placing of the required coin in the meter and the consumer shall be accountable to the Council for the safe custody of the money until it shall have been collected by the Council's authorised officials and the official receipt shall have been given in exchange therefor (the authorised officials can be identified by their numbered badges).

In case of any defects or failures of the apparatus contained in the meter for controlling the supply and in case, for any cause, the sum placed in the meter is found to be less than the sum which ought to be there, having regard to the quantity of electrical energy recorded, the consumer shall forthwith on demand pay the deficiency.

No coins other than the legal coins of the realm, for which the prepayment meters are constructed, or any metal, or other, disks shall be inserted in the meter.

E. W. Jones,
U.D.C. Electricity Department.

Mountain Ash, *March 8th*, 1929.

Service Boxes.

I have been very interested in the correspondence relating to the above subject. Most mains engineers have definite views on the matter, but after all the simplest method of completing a low-pressure service joint would appear to be by enclosing it in a cast-iron box filled with compound, provided it can be shown that this method stands the test of time.

The system with which I am concerned has about ten thousand service joints so made, and joint box trouble is rare in the extreme. Joints made twenty-five years ago have been opened up and found to be in excellent condition.

I think, therefore, that a joint simply enclosed in a cast-iron box properly topped up, is at least as reliable in service as the more scientifically correct lead sleeve. It is certainly cheaper, both as regards time and material.

H. G. S.

March 8th, 1929.

[Two or three letters reached us too late for publication this week.—Eds. Elec. Rev.]

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be numbered and abridged, and all subsequent proceedings will be taken.

1927.

21,364. "Wireless signalling systems." Q. C. A. Craufurd and C. C. J. Frost. August 12th, 1927. (305,953.)

21,607. "Television or like systems." J. L. Baird and Television, Ltd. August 17th, 1927. (306,158.)

26,850. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and O. A. Pearce. October 10th, 1927. (305,956.)

27,004. "Electrical switches." J. A. Crabtree. October 12th, 1927. (305,957.)

27,433. "Wireless receiving sets." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). October 15th, 1927. (306,056.)

27,614. "Producing gramophone records from wireless electrical impulses." J. Wilson. October 18th, 1927. (306,164.)

27,692. "Sound amplifiers." F. A. Mitchell. October 18th, 1927. (306,166.)

27,993. "Apparatus or devices used in the reproduction of sound." W. A. Halden. October 21st, 1927. (306,193.)

29,871. "Production of insulating material.' B. Marchini (G. Passatti). November 8th, 1927. (306,011.)

30,240. "Lighting apparatus." G. Murray and V. O. Simpkins. November 10th, 1927. (305,963.)

30,338. "Systems for repeating electrically the readings of gyroscopic compasses." A. E. White (Sperry Gyroscope Co.). November 11th, 1927. (306,057.)

30,371. "Storage batteries." C. H. Everett and G. R. Carr. September 3rd, 1927. (296,660.)

30,435. "Telephone systems." Associated Telephone and Telegraph Co. January 8th, 1927. (283,193.)

30,454. "Apparatus for electrically measuring fluid flow." H. Martin. November 12th, 1927 (306,014.)

30,526. "Oil-immersed electric switchgear." A. West & Co., Ltd., and A. West. November 14th, 1927. (306,016.)

30,885. "Protective arrangements for alternating-current electric circuits." A. Reyrolle & Co., Ltd., J. Mirrey and G. H. Gardner. November 17th, 1927. (306,178.)

30,955. "Lighting of indicating instruments on automobile and like vehicles." A. L. Jones. November 17th, 1927. (306,183.)

31,023. "Method for the production of cathodes for electric discharge tubes." Vereinigte Glühlampen und Elektricitäts Akt. Ges. April 30th, 1927. (289,763.)

31,185. "Electric fuses." A. Reyrolle & Co., Ltd., B. H. Leeson and R. H. Brierly. November 21st, 1927. (Addition to 276,740.) (306,197.)

31,186. "Electric switches." A. Reyrolle & Co., Ltd., J. Mirrey and A. Allan. November 21st, 1927. (306,198.)

31,962. "Auxiliary control means for prime movers." British Thomson-Houston Co., Ltd. November 29th 1926. (281,329.)

32,165. "Electromechanical devices of the induction type." E. W. Challans and Westinghouse Brake and Saxby Signal Co., Ltd November 29th, 1927. (306,211.)

33,738. "Electrode holders for arc-welding." R. Sarazin. December 18th, 1926. (282,392.)

34,439. "Electromagnetic testing of steel-wire ropes and other articles of magnetizable material." T. F. Wall. December 20th, 1927. (Cognate applications 5,547/28 and 12,320/28.) (306,232.)

34,865. "Electric discharge devices." British Thomson-Houston Co., Ltd. December 23rd, 1926. (282,766.)

1928.

23. "Electrolytic deposition of chromium." Langbein-Pfangauser-Werke Akt. Ges. December 1st, 1927. (301,478.)

1,040. "Manufacture of moulded articles, such as switch bases, fuse holders, and other electrical apparatus." J. A. Crabtree and J. R. Dolphin. January 12th, 1928. (306,249.)

1,548. "Sound recording and reproducing apparatus." H. Hallam and J. R. M. Hellary. February 17th, 1927. (285,454.)

1,404. "Inter-valve couplings for thermionic valves." A. F. Pollock and D. A. Pollock. January 16th, 1928. (306,253.)

2,811. "Sound reproducing and receiving instruments." E. V. Mackintosh and C. French. January 28th, 1928. (306,263.)

3,669. "Loud-speaker apparatus for wireless telephony." W. Bryan. February 6th, 1926. (306,268.)

4,368. "Loud-speaking apparatus for wireless or other purpose." E. J. Marriott and C. French. February 11th, 1928. (306,278.)

5,051. "Conveyors for baths for the treatment of objects, more particularly for electrolytic baths." Siemens & Halske Akt Ges. October 5th, 1927. (298,184.)

5,301. "Manufacture of thermionic cathodes for electric discharge devices." M.O. Valve Co., Ltd., A. L. Reimann and J. W. Ryde. February 20th, 1928. (306,281.)

6,120. "Head-lights for motor vehicles and the like." M. Guye and R. Furrer. March 9th, 1927. (286,689.)

6,714. "High-frequency telephone systems." J. J. V. Armstrong (Telefunken Ges. fur Drahtlose Telegraphie). March 3rd, 1928. (306,292.)

6,971. "Electric meters." British Thomson-Houston Co., Ltd. March 7th, 1927. (286,647.)

8,100. "Circuit arrangement for telephone installations with main and branch exchanges and selector working." Siemens & Halske Akt. Ges. August 30th, 1927. (296,363.)

8,101. "Circuit arrangement for double-duty selectors in telephone installations." Siemens & Halske Akt. Ges. September 1st, 1927. (296,424.)

9,932. "Electric accumulators." E. Thomas & Williams, Ltd., and J. Bowen. April 2nd, 1928. (306,312.)

10,173. "Current transformers." International General Electric Co., Inc. April 13th, 1927. (288,606.)

11,347. "Telephone systems." Siemens Bros. & Co., Ltd., and D. P. Long. April 17th, 1928. (306,323.)

12,649. "Sheet-metal laminated cores for dynamo-electric machines." Siemens-Schuckertwerke Akt. Ges. August 27th, 1927. (296,299.)

13,121. "Electric light fittings." Maxlume Lighting and Heating Co., Ltd., and F. W. Thorpe. May 4th, 1928. (306,336.)

13,144. "Electric switchgear." C. Nunn. May 4th, 1928. (306,337.)

15,275. "Induction voltage regulators." British Thomson-Houston Co., Ltd. May 25th, 1927. (291,058.)

15,691. "Protective arrangement for springs used in association with electrical apparatus." Hermsdorf-Schomburg-Isolatoren Ges. May 1st, 1928. (306,344.)

18,358. "Electrical circuit-controlling apparatus." Metropolitan-Vickers Electrical Co., Ltd. June 24th, 1927. (292,922.)

21,101. "Cathode-ray oscillographs." Dr. W. Rogowski and Dr. E. Flegler. August 18th, 1927. (295,710.)

23,314. "Avoidance of cross-talk in telephone cables." Felten & Guilleaume Carlswerk Akt. Ges. August 11th, 1927. (295,592.)

23,359. "Means for transmitting radiant energy such as light, and apparatus for use therewith." Marconi's Wireless Telegraph Co., Ltd. August 13th, 1927. (295,601.)

26,000. "Circuit arrangements for use in high-frequency communication systems." Marconi's Wireless Telegraph Co., Ltd. September 10th, 1927. (297,004.)

32,520. "Electric signalling-circuit for use in mines." Siemens Schuckertwerke Akt. Ges. November 23rd, 1927. (301,021.)

36,351. "Trolley-heads for electric traction." C. C. G. Taylor. September 14th, 1928. (Divided application on 26,558/27.) (306,378.)

Trade Mark Applications.

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 6th :—

The Whispering Cleaner. No. 495,350. All goods in Class 6.—Siemens-Schuckertwerke Gesellschaft, Berlin. (British representatives: Haseltine, Lake and Co., 28, Southampton Buildings, Chancery Lane, W.C.2.)

Stradonola. No. 497,086. Class 8. Instruments and apparatus and parts thereof for use in radio-telephony and telegraphy.—A. J. Balcombe, Ltd., 51, Tabernacle Street, E.C.2.

Carbeloy. No. 497,590. Class 6. Machine tools.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

Ramaco. No. 496,230. Class 8. Instruments and apparatus for use in radio-telephony.—Radio Maintenance Co., 8, Clarendon Road, Edgbaston, Birmingham.

Rotorohm. No. 498,852. Class 8. Apparatus for use in radio-telegraphy and telephony.—Rotor Electric Co., Ltd., 34, Kingsway, W.C.2.

Wild-Barfield. No. 497,389. Class 18. Electric furnaces and electric heaters.—Wild-Barfield Electric Furnaces, Ltd., North Road, Holloway, N.7.

Tensulam. No. 477,436. Class 50. Insulating preparations (electrical) of asbestos, mica, resin, oils or bitumen.—Berry, Wiggins & Co., Halling Works, Channelsea Road, E.15.

Zico. No. 497,466. Class 50. Bell pushes, ceiling rosettes, table and floor standards, &c.—Albert Feustel, trading as P. Zimmermann & Co., Deutsch-katherinenberg, Germany. (British representatives: Hook & Willis, Ltd., 29, Ely Place, Holborn, E.C.1.)

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ALSTON (Cumberland).—Extensions, Ruth Lancaster James Cottage Hospital; W. Lawson, hon. secretary, Roseland (returnable deposit of 5s.).

ARBROATH.—Extensions to Infirmary (£15,000); Mr. Clark, architect.

ASHFORD (Middlesex).—32 houses and 21 bungalows, Feltham Hill Road; Sandell & Wren.

BANSTEAD.—Isolation hospital extensions for Epsom, Sutton, Carshalton and Leatherhead Joint Hospital Board; A. C. Williams & Pettett, architects, Reids Building, Ashley Road, Epsom (returnable deposit of £3 3s.).

BARROW.—Hotel, Walney (£30,000); for James Thompson and Co.

BEDDINGTON AND WALLINGTON.—Houses (100), Elmgrove Estate; for C. R. Leach.

BIRMINGHAM.—473 houses, Court Farm Estate; Morris Jacombs & Sons, Ltd. 291 houses, Gospel Farm Estate; Henry Boot & Sons, Ltd. 100 houses, Witton Lodge Estate; W. J. Sims, Sons & Cooke, Ltd. 395 houses, Stockland Green Estate; W. Edwards, Contractors (Birmingham), Ltd. Baptist church, Six Ways; West Midlands Baptist Association (local branch).

BOLTON.—Works extensions, Bury Road; Ainsworth Mercerising Co., Ltd. Extensions, Chandos Street 'bus garage; J. E. Norris & Co.

BRENTWOOD.—Laundry, Mental Hospital (£34,000); Essex county architect.

BRIGHTON.—Extensions, Sussex Eye Hospital (£25,000); secretary.

CHELTENHAM.—50 houses, Steward, Folly Lane.

CHESTERFIELD.—New Boythorpe School (£18,000); Wilcockson & Cutts, architects.

CHORLEY.—Hospital, Preston Road, Rookwood; secretary, Chorley Hospital.

CLITHEROE.—Council school (to seat 600), Brownlow Street; secretary to the Education Committee.

DARLINGTON.—Extensions, ward blocks and operating theatres, Memorial Hospital; W. J. Moscrop, architect (returnable deposit of £3 3s.).

DUDLEY.—Extensions, Guest Hospital, Tipton Road; governors.

DUNFERMLINE.—Extension of West Fife Hospital; secretary to the Hospital.

EASTBOURNE.—Factory, Moy Avenue; commercial garage, Ceylon Place; J. Bowley, architect.

EDINBURGH.—18 houses for Welfare Housing Trust (electrical work); A. H. Mottram, architect, 59, Frederick Street.

EXETER.—Public library (£31,750), for the T.C.; city surveyor.

FLEETWOOD.—Dock extensions (£100,000); for L.M. & S. Railway.

GLASGOW.—Reconstruction of Waldorf Palais de Dance (to be wired for talking pictures); C. J. McNair, architect, Bath Street. 300 houses for Corporation; architect, Housing Department. Shops at Half Way for Kinning Park Co-operative Society; the manager. Hall for 500 persons, adjoining Pollokshaws Burgh Hall; city engineer.

GODALMING.—Additional 74 houses, for the T.C.; borough surveyor.

GRAYLINGWELL.—Extensions, Mental Hospital (£130,000), for West Sussex C.C.; clerk, Chichester.

GUILDFORD.—Extensions, High Street and Quarry Street, for F. W. Woolworth & Co., Ltd., bazaar proprietors, Kingsway, London.

HASTINGS.—Additions, Tilbury Home, West Hill, for Ranyard Mission; Searle & Searle, architects.

HORWICH.—School (£24,535), for Lancs. E.C.; education architect, Preston.

HOVE.—Nursery school (£37,000), for the Borough E.C.; director of education.

HULL.—154 houses, Rustenberg Street site; city architect. Alterations, Tivoli Theatre; Mr. H. Slingsby. 254 houses, Derrington Estate; H. M. Nowell, Ltd. Infants' school, Hall Road (£16,000); Hinch Bros., Ltd.

ILKESTON.—Factory, Bath Street; Henry Carrier & Son, Ltd.

KESWICK.—Re-erection of Royal Oak Hotel, for the Lake District Hotels, Ltd.; Colonel P. M. Hope, managing director (£15,000).

KIRKCUDBRIGHT.—Hostel for Scottish Artificial Silks, Ltd.; W. A. MacKinnell, architect, Town Hall.

LANCASTER. — Extensions, Royal Infirmary (£75,000); secretary.

LEAVESDEN.—Extensions, Mental Institution (£166,903); C. Miskin & Sons, Ltd., Bedford Row, W.C.

LEEDS.—Conversion Alhambra Palais de Danse to skating rink; H. Pemberton. Branch library at Hunslet; specification, &c., from W. T. Lancashire, city engineer; tenders to Town Clerk's office, Great George Street.

LIVERPOOL.—Women's hospital, Faulkner Street; Committee of Liverpool Women's Hospital.

LONDON (East Ham, E.).—Alterations, Empire Kinema, Barking Road; G. Coles. 234 houses, Roman Road Estate; J. Stokes & Son. 51 houses, White Horse Road; J. H. Lohden.

(Finchley, N.).—Maternity ward, Memorial Hospital; governors.

(Camberwell, S.E.).—Staff accommodation, Grove Hospital (£21,635); Metropolitan Asylums Board.

(Southwark, S.E.).—Reconstruction of workshops at central fire station (£6,000); L. H. & R. Roberts.

MAIDSTONE.—Additional housing scheme, Mote Park (130 to 150), for the T.C.; borough surveyor.

MANCHESTER.—Extensions, College of Technology, Sackville Street; Education Committee. Extensions, Oaklands Home; Manchester and Salford Blind Aid Society. Hospital, for the Committee of the Manchester Northern Hospital for Women and Children.

MILTON REGIS (Kent).—Housing scheme (92), for the U.D.C.; A. W. Callaway, surveyor.

MITCHAM.—Houses (87), for I. H. Wilson. Houses (67), Western Road, for H. Poulson.

NORTHAMPTON.—Extensions, boot factory, Adnitt Road; L. Sears & Co., Ltd.

ORMSKIRK.—Reconstruction, Scarth Hill pumping station, with engine house, &c., for Southport, Birkdale and West Lancashire Water Board; C. B. Ede, engineer, 14, Portland Street, Southport (returnable deposit of £2 2s.).

PAISLEY.—Extensions at Royal Alexandra Infirmary, to cost £6,000; the medical superintendent.

PENRITH.—Electric light installation, Christ Church; vicar.

PETERHEAD.—Conversion of mansion house into municipal offices; burgh surveyor.

PORT GLASGOW.—Conversion of mansion house into children's home (ray treatment); Sir James Lithgow.

POTTER'S BAR.—Housing scheme (118), for South Mimms R.D.C.; surveyor.

READING.—Aerodrome, Woodley, for Phillips & Powis, Oxford Road.

ROCHESTER.—Four blocks of flats, for the T.C.; W. Law, city surveyor (returnable deposit of £3 3s.).

ROTHERHAM.—Offices, shops, showrooms and workshops (£20,000), for the T.C.; borough engineer.

SHEFFIELD.—56 houses, Wisewood Estate; Messrs. H. Freckingham & Sons, Ltd. 47 houses, Wisewood Estate; W. Ellis.

SHERBORNE (Dorset).—Extensions, Yeatman Hospital (£6,000); John Dingley, hon. secretary.

SMETHWICK.—Works extensions, Dartmouth Road; Midland Motor Cylinder Co., Ltd. 58 houses, Smethwick Hall Estate; Housing, Ltd., Blackheath.

SOUTHPORT.—Ice skating palace; Gilbert Wilson, architect.

STAMFORD (Lincs.).—56 houses for T.C. at New Cross Road; borough surveyor.

SUNDERLAND.—Extension of Royal Infirmary (£50,000); for the governors.

TIVERTON.—Hospital (£30,000), for the Committee; secretary.

TWICKENHAM.—Garages, shops and flats, Richmond Road (£25,000), for W. Hinde.

WISBECH.—Factory, for the British Basket Co., Ltd.